APRIL 1956 – SIXTY-SECOND YEAR

MACHINERY

the original . . .

FAFNIR WIDE INNER RING BALL BEARING
WITH SELF-LOCKING COLLAR (SLINGER OR CONTACT TYPE SEALS)
USED IN A WIDE VARIETY OF FAFNIR INDUSTRIAL UNITS.

in 1918
— this Fafnir development broke the cost-barrier that restricted the use of ball bearings for straight shaft mountings.

in 1956
— world-wide use and performance records prove that it is still one of the most outstanding single developments in the ball bearing industry.

FAFNIR BALL BEARINGS The most complete line in America

The Fafnir Bearing Company, New Britain, Conn.

Exit...

ONE SITTING DUCK

A message of importance to all contestants in the battle against high production costs

PIT A World War II plane against a modern jet fighter and what have you got? One sitting duck! Why? Not because the "prop job" got any *slower*. But because the modern supersonic jet got so much *faster!*

So it is with machine tools. The machine you bought ten years ago may still be working just as good as ever. Yet by today's standards of production speed and economy, that same machine can be *losing money* — perhaps more than a new machine would cost.

This "creeping obsolescence" can often go unnoticed—particularly on small-lot and tool room machines that are not geared directly to a fast-moving automated production line. So take a good look at the old universal Bore-Matics, Rotary Surface Grinders, Tool-Room and Plain Internals in your shop. Check their production and maintenance costs. The results may surprise you.

Your Heald sales engineer will be glad to help you evaluate these machines, fairly and squarely — to show you whether they are earning money for you, or losing it. If you find that you're *paying* for a new machine, you might as well *have* it!

IT PAYS TO COME TO HEALD

HEALD®

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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MACHINERY

Volume 62 APRIL, 1956 NUMBER 8

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

SHOP PRACTICE

Transfer Machines Boost Output of Hydra-Matics *By Reuben R. Jensen* 164
Usage Charts Increase Tool Life ..... *By Charles H. Wick* 179
Round Drop-Hammer Dies Provide Important Economies *By J. H. Rowley* 183
Carbide Milling Speeds Output of Die-Blocks . *By Carl C. Latora* 188
Ford Expands Cleveland Operations ..... *By Edgar Altholz* 190
Stretch-Forming Titanium Sections ..... *By Ralph A. Kiehl* 196

MACHINE AND TOOL DESIGN

"Frictionless" Design with Ball Bearing Screws and Splines *By David A. Golonska* 159
Designing Progressive Dies ..... *By H. C. Tsien* 173
Building the Big Ones ..... *By Robert M. Husband* 202
Rotating Crank that Provides a Dwell in Reciprocating Motion *By H. B. Schell* 207
Counting Device for High-Speed Operation .... *By B. J. Popper* 208
Synchronized Quad Vernier Dividing Head .... *By J. R. Hansen* 210
Tapping Fixture for Die-Cast Part ..... *By W. M. Halliday* 212
Every Specification on a Blueprint Isn't Gospel 214
American Standard Machine Pins (Data Sheet) 247

MANAGEMENT PROBLEMS

Government Problems in an Election Year .. *By Loring F. Overman* 155
Why Doesn't the Government Cut This Waste? *By Charles O. Herb* 157
Training Older Salesmen for Retirement .... *By Bernard Lester* 199

DEPARTMENTS

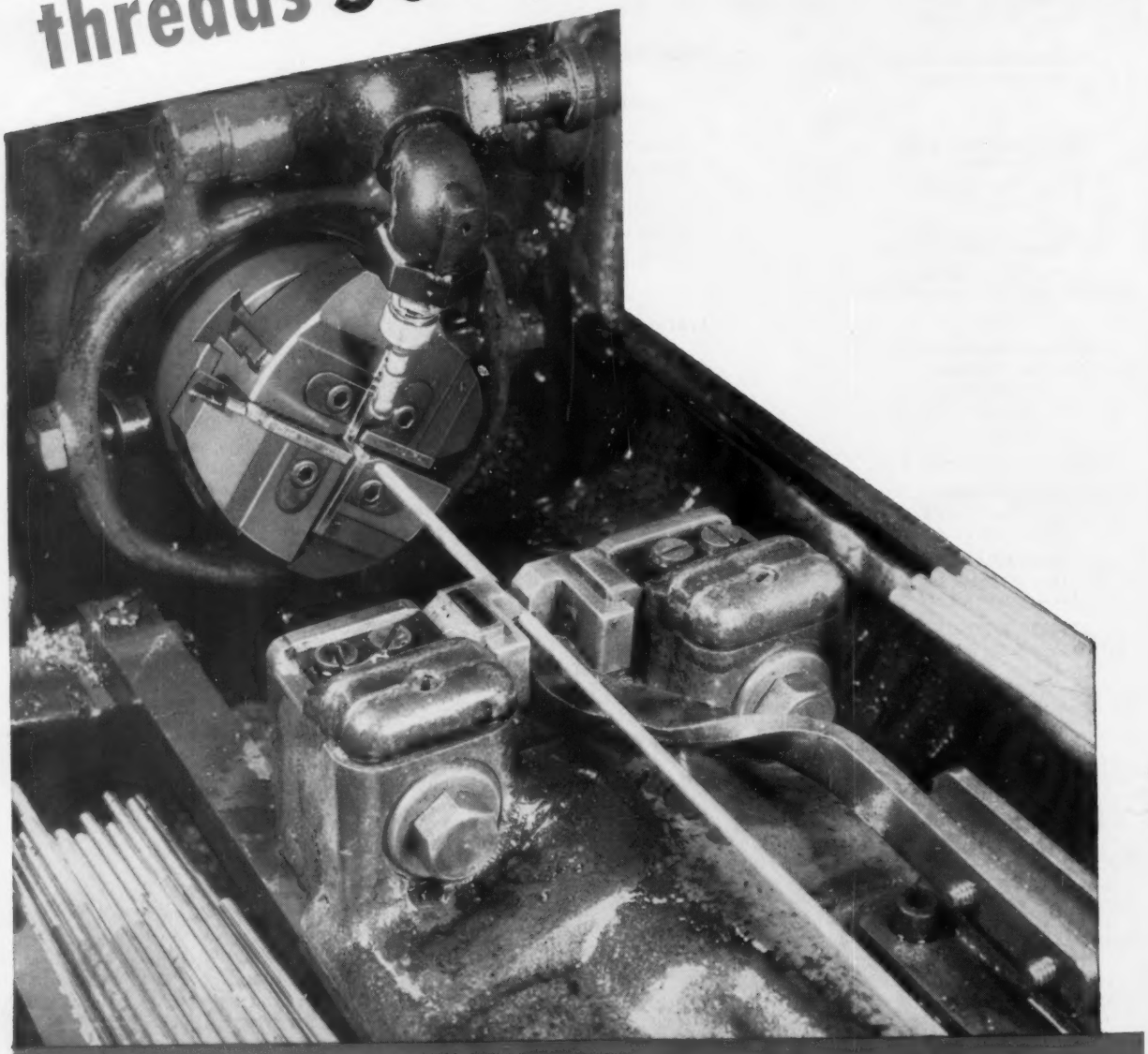
Keeping Up with Washington 155
Materials of Industry 186
Talking with Sales Managers 199
In Shops Around the Country 200
Ingenious Mechanisms 207
Tool Engineering Ideas 210
Problem Clinic 214
The Latest in Shop Equipment 216
Data Sheet 247
New Catalogues 257
Between Grinds 264
News of the Industry 266
Book Reviews 275
Coming Events 276

Product Directory
290

Advertisers Index
391-392

3/8" Machine

threads 500 pieces per hour



THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT

A LANDIS 3/8" Threading Machine has increased the output of threaded automobile seat lock rods by 25%.

#10 24-pitch UN threads are cut 1¾" long on 54" galvanized wire rods. Production now averages about 500 pieces per hour, with 4,500 pieces threaded between grinds of the chasers. With excellent production between chaser grinds, low tool cost and minimum downtime are assured through the use of long-life LANDIS Tangential Chasers which can be reground for 80% of their original length.

These savings are being realized at Mid-West Wire Products in Detroit, Michigan. Best previous threading methods never produced more than 400 pieces per hour, and completed only 2,500 pieces before requiring the chasers to be reground.

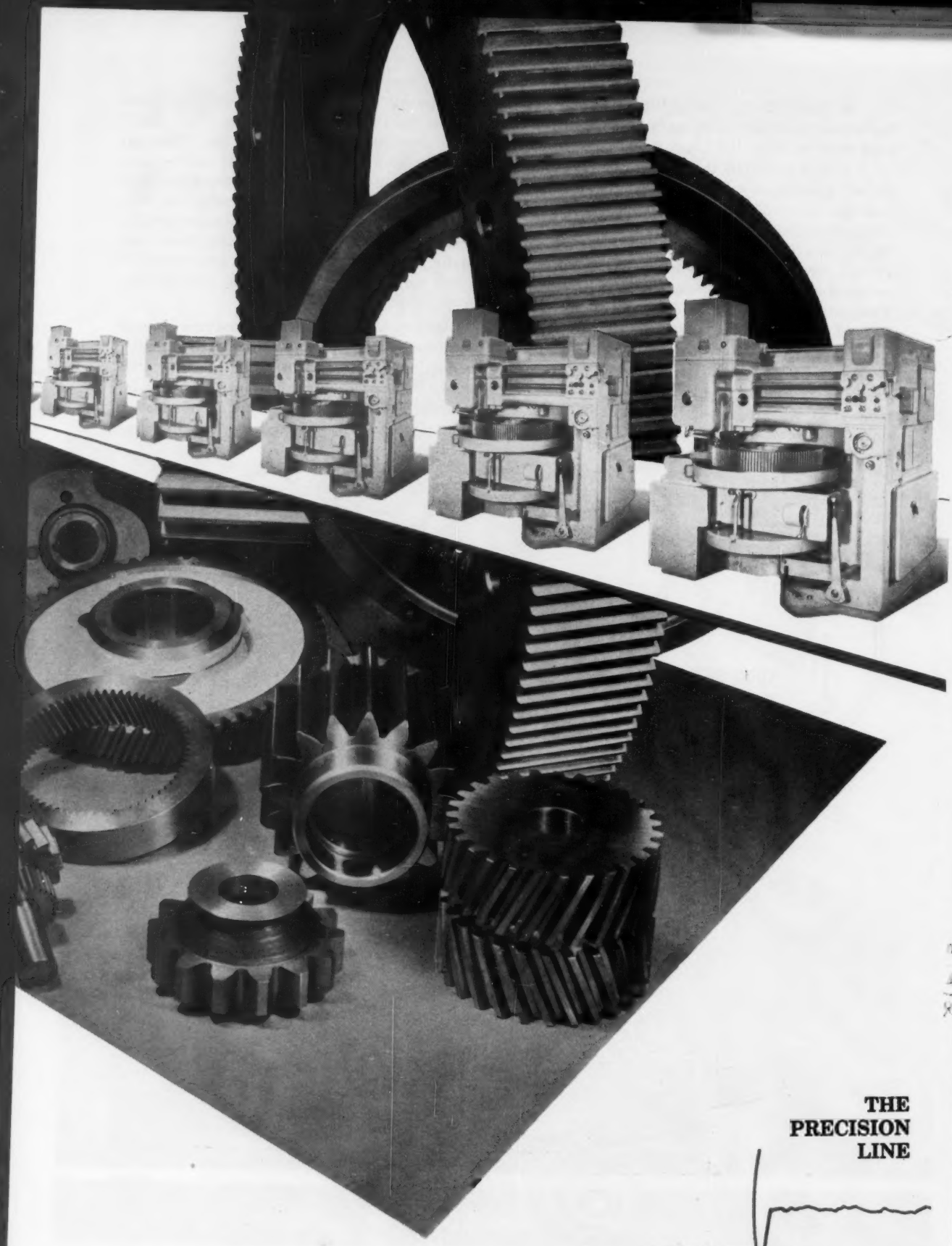
The 3/8" Machine is a small high-speed machine for threading small parts (3/16" to ½" in diameter) to precision tolerances. This machine has been designed so that it can be operated with only one hand, freeing the other hand for loading and unloading the workpiece. The opening and closing of the grips is automatically controlled by the carriage operating lever, and the die head automatically opens on completion of the thread and closes during the carriage return.

Analyze the threading operations in your plant today for the possibility of a similar production saving. Then send us the specifications of the workpiece involved, and ask for Bulletin H-91 for more detailed information about the LANDIS 3/8" High Speed Threading Machine.

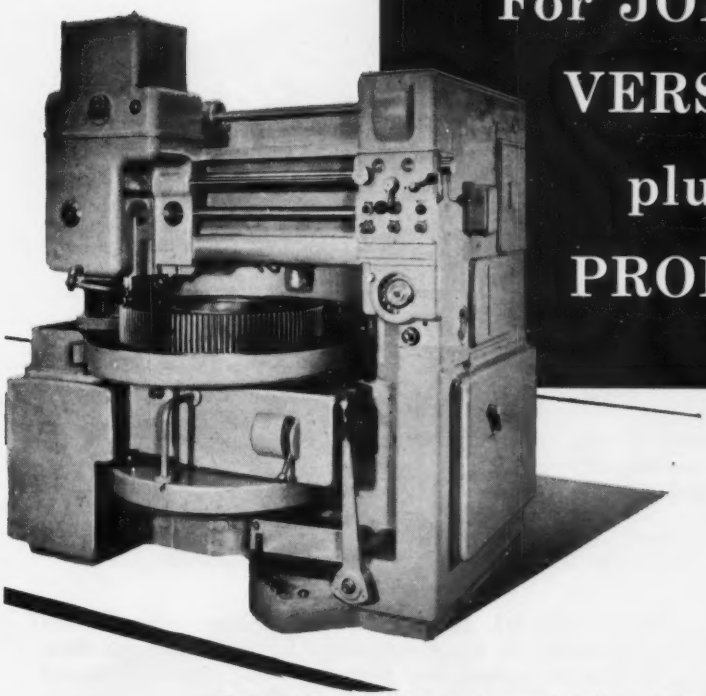
LANDIS Machine COMPANY
WAYNESBORO
PENNA., U.S.A.

282-2-C

CUTTING - TAPPING - GRINDING - ROLLING



THE PRECISION LINE



For JOBBING VERSATILITY plus HIGH PRODUCTION

HERE'S versatility that pays dividends. For the Fellows 36-Type Gear Shaper has real "earning power"... whether used to handle virtually every job that comes up in a small gear department... or concentrated upon the heavy work in a large production shop.

A powerful, ruggedly constructed, heavy duty machine, the 36-Type can take extra heavy cuts at high speed... yet hold close limits. Low set-up time, fast gear-shift change from heavy to fine feed, quick dial adjustment from one cutter-spindle speed to another... these are just a few of the ways the 36-Type keeps down costs.

Ask your Fellows Representative to explain *all* the profit-making advantages built into the 36-Type... as well as the Fellows Plan for deferred payment. Write, wire or phone any Fellows Office!

THE FELLOWS GEAR SHAPER CO., Head Office and Export Dept., 78 River St., Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
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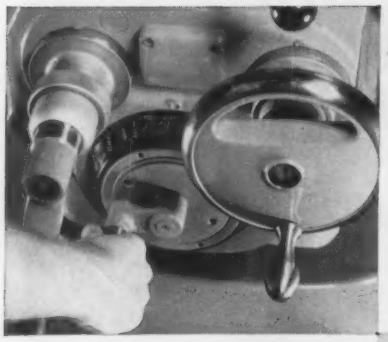
Fellows *Gear Production Equipment*

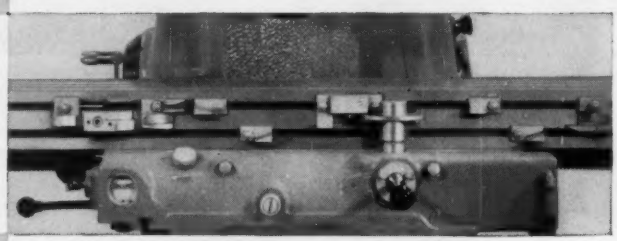
Have You Heard

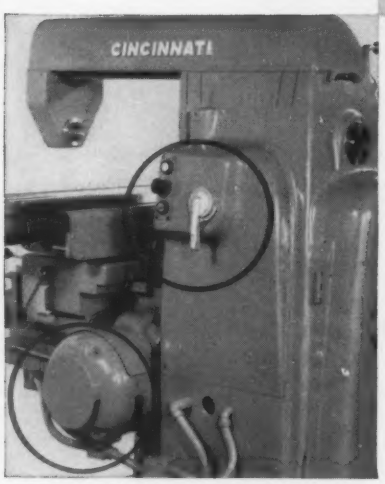
about the finest general



It's quick and easy to change feed rates. A single crank-type control, at the front of the knee, selects 16 feeds from ¼" to 30" per minute.

Automatic reciprocal milling setups, with center safety stop, may be assigned to Automatic Cycle Machines. That's because automatic backlash eliminator is a standard feature.





Electrical controls are built in, protected from dust and damage, and incorporate operator protection through interlocked disconnect switch. Individual motor for feed drive.

CINCINNATI ML and MI Milling Machines always were considered the finest equipment for toolroom work. Now they're better than ever before, and in addition, plain and vertical machines are available with or without automatic table cycles. And for a little more, automatic cycle machines can be equipped with automatic spindle stop. There you have the story in a nutshell.

Size, style and automatic features are related in the following manner:

New Nos. 2ML and 2MI Plain; built as toolroom millers, or as production millers with no loss of versatility. New Nos. 2ML and 2MI Universal; fine toolroom millers equipped with a new design Cincinnati Dividing Head (no automatic cycle). New No. 2MI Vertical; a toolroom miller, or production miller with no loss of versatility.

Three Cincinnati features of value in lowering your costs are illustrated here. Of course, there are many more, all of which are outlined in the new CINCINNATI 2ML and 2MI catalog, No. M-1916. Write for a copy, or telephone our nearest agent or office.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

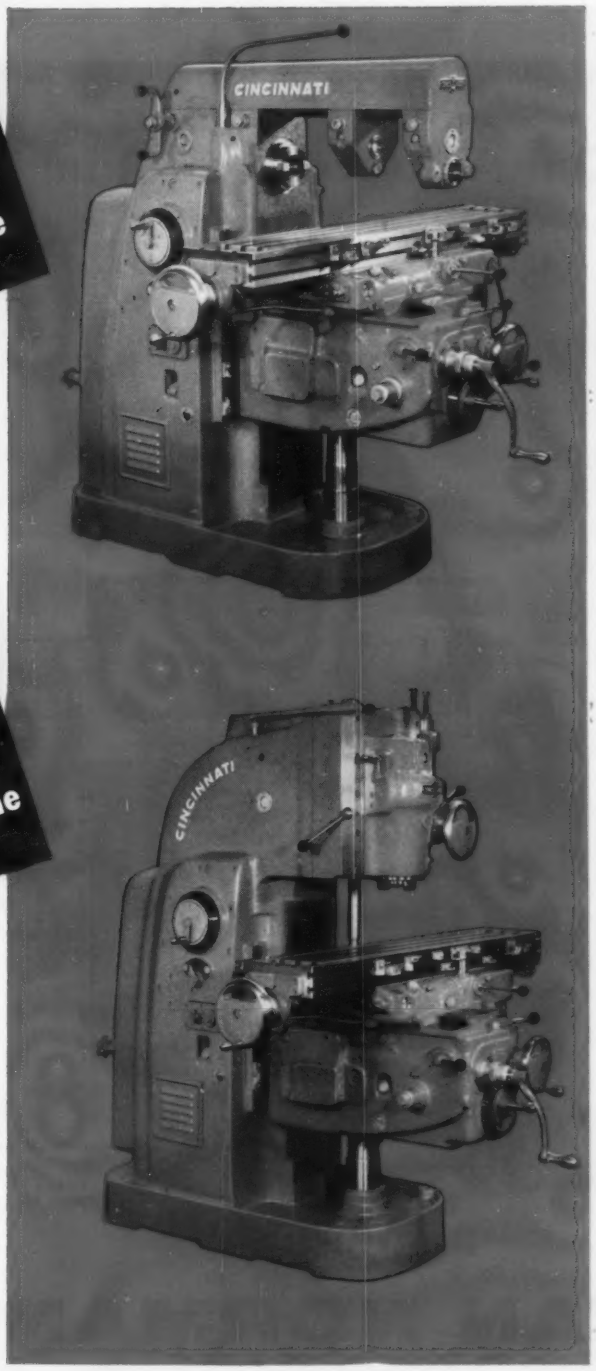
CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING

the Latest . . .
production
~~purpose~~ milling machines?

NEW CINCINNATI 2MI Plain Milling Machine

NEW CINCINNATI 2MI Vertical Milling Machine



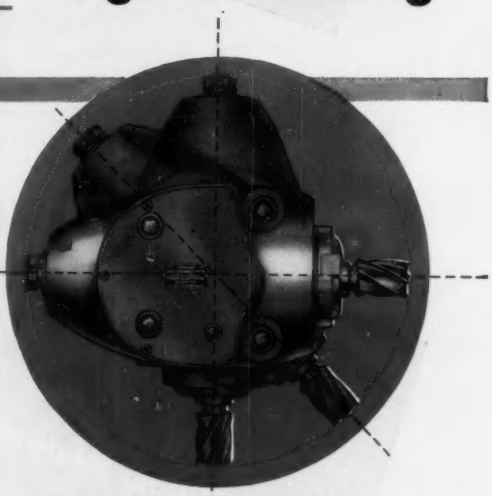
MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

For more information fill in page number on Inquiry Card, on page 257

VERSA

of VAN NORMAN Millers

One Van Norman Ram Type Miller Gives You the WORKABILITY of TWO Single Purpose Machines PLUS Angular Milling



Van Norman exclusive adjustable cutterhead permits horizontal, vertical or angular milling on one machine without attachments.

This No. 38M big three purpose miller costs you only $1.07 per hour to own after minimum down payment on a 5-year-conditional sales contract.

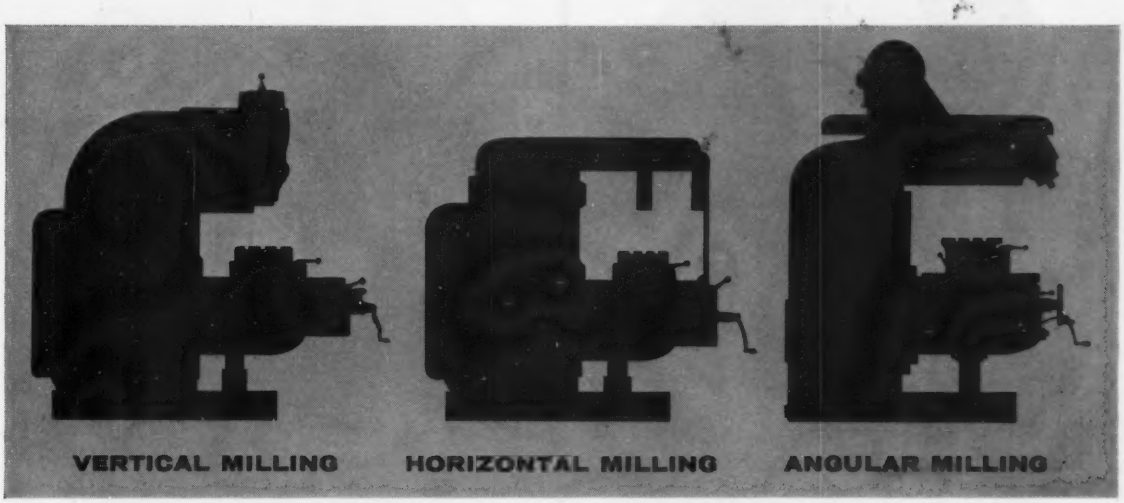
NO. 38M
Table Size: 64" x 14"
Spindle Cutterhead motor: 10 HP
Ram Travel: 29"
Speeds: 12
Feeds: 18

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

TILITY

Saves Your Machine Dollars...



You do them all on one Van Norman Ram Type Miller

Regardless of the type of plant or type of work, a Van Norman Ram Type Miller can cut your milling costs and speed production. These versatile millers reduce idle machine time by as much as 50%.

But that's not all — with a Van Norman you save on capital expenditures, too! Here's how — with one Van Norman Ram Type Miller you can do horizontal, vertical as well as angular milling without attachments . . . all on *one* machine. This means less machine purchase dollars needed, more overall production from each miller because there is *no waiting* for single purpose machines.

Find out how you can profit with a Van Norman Ram Type Miller. They are available in 14 basic models . . . a size to meet your particular requirements.

Write for full information, today.

Don't wait . . . for extra profits, install a Van Norman now!
They are available on five purchase plans — Outright sale . . .
Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy.
See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

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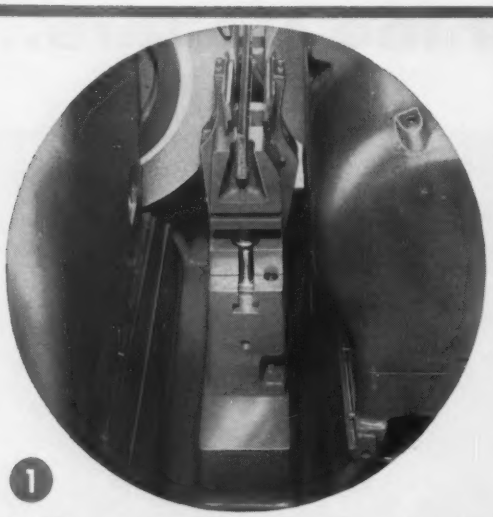
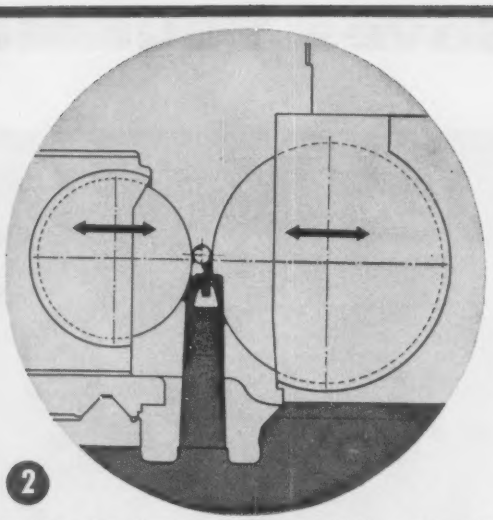
4 reasons why Landis centerless



1

"Rigid" work rest Solid support permits extra heavy cuts without loss of accuracy or finish.



2

Landis method of centerless grinding Work positioned on rigid work rest—Grinding and Regulating Wheel Heads slide on hand scraped ways.

3

Completely adjustable regulating wheel head

a. Tilt adjustment
b. Swivel adjustment
c. Wheel feed handwheel
d. Wheel aligning screw

4

***Both* grinding and regulating wheel spindles have Microsphere bearings** For fast spark-out . . . close tolerances . . . fine finishes

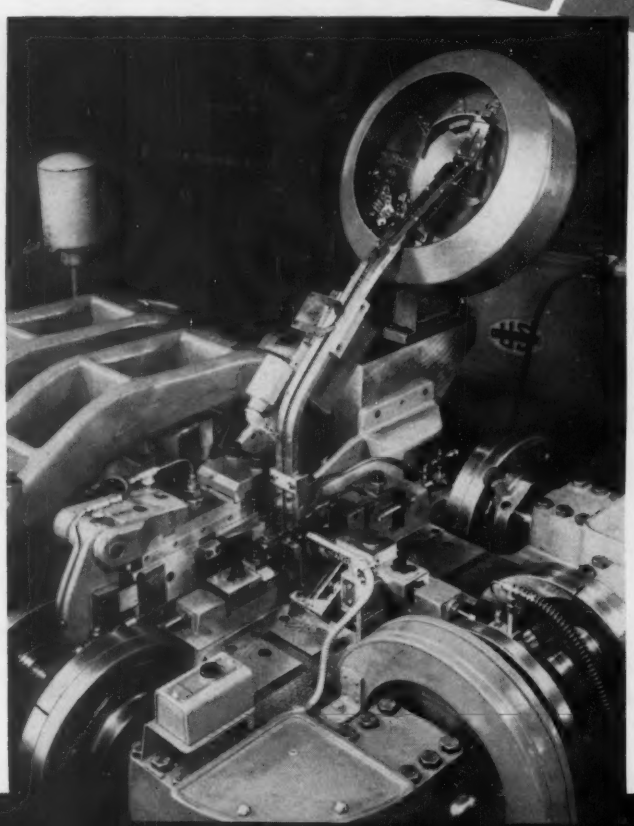
LANDIS

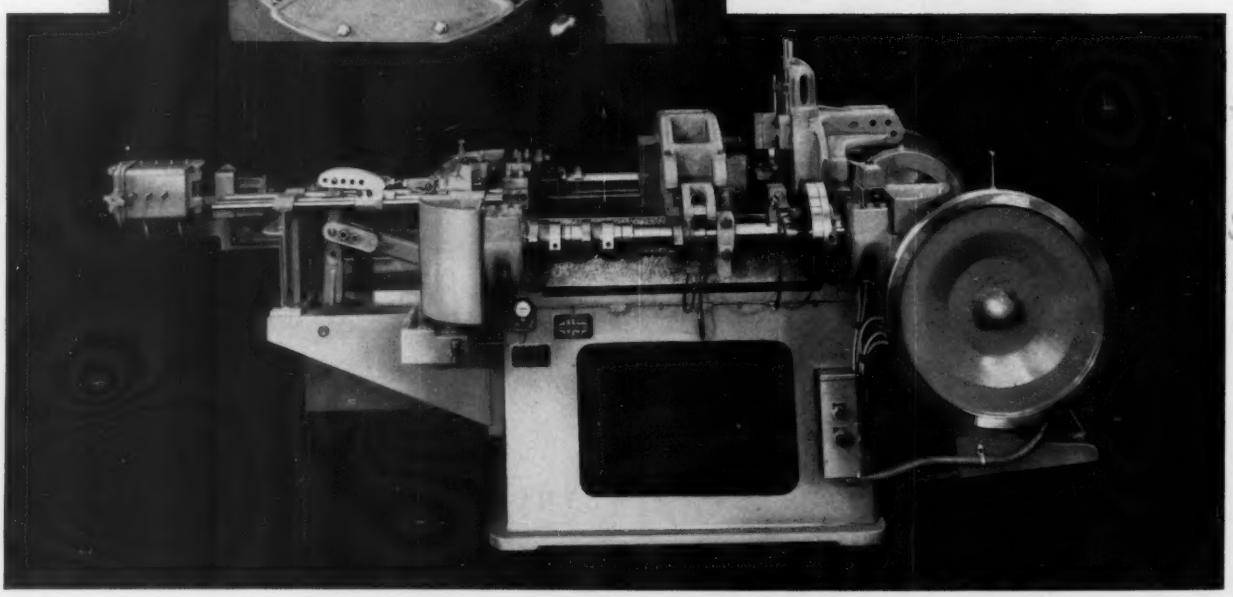
precision grinders

grinders lower production cost

No. 12 Centerless Grinder

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

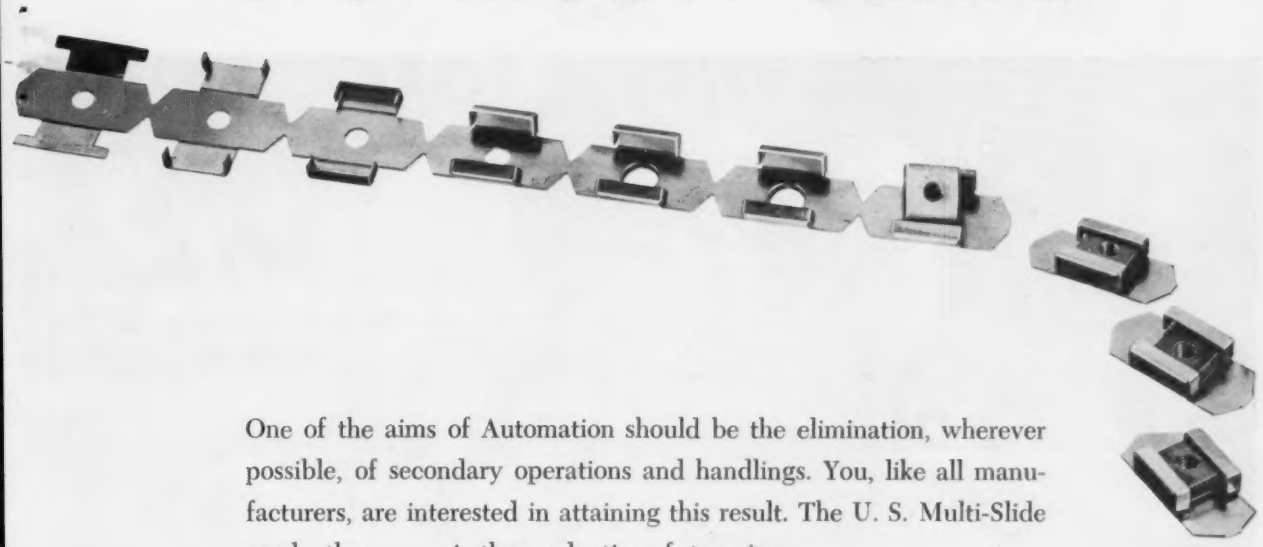




Left: Hopper feed unit mounted on U. S. Multi-Slide Machine for hoppering the nuts into position for assembly.

Below: Standard No. 33 U. S. Multi-Slide Machine on which the hopper feed unit is installed.

Automation in Stamping Production Illustrated on the U. S. MULTI-SLIDE®



One of the aims of Automation should be the elimination, wherever possible, of secondary operations and handlings. You, like all manufacturers, are interested in attaining this result. The U. S. Multi-Slide can be the answer in the production of stampings.

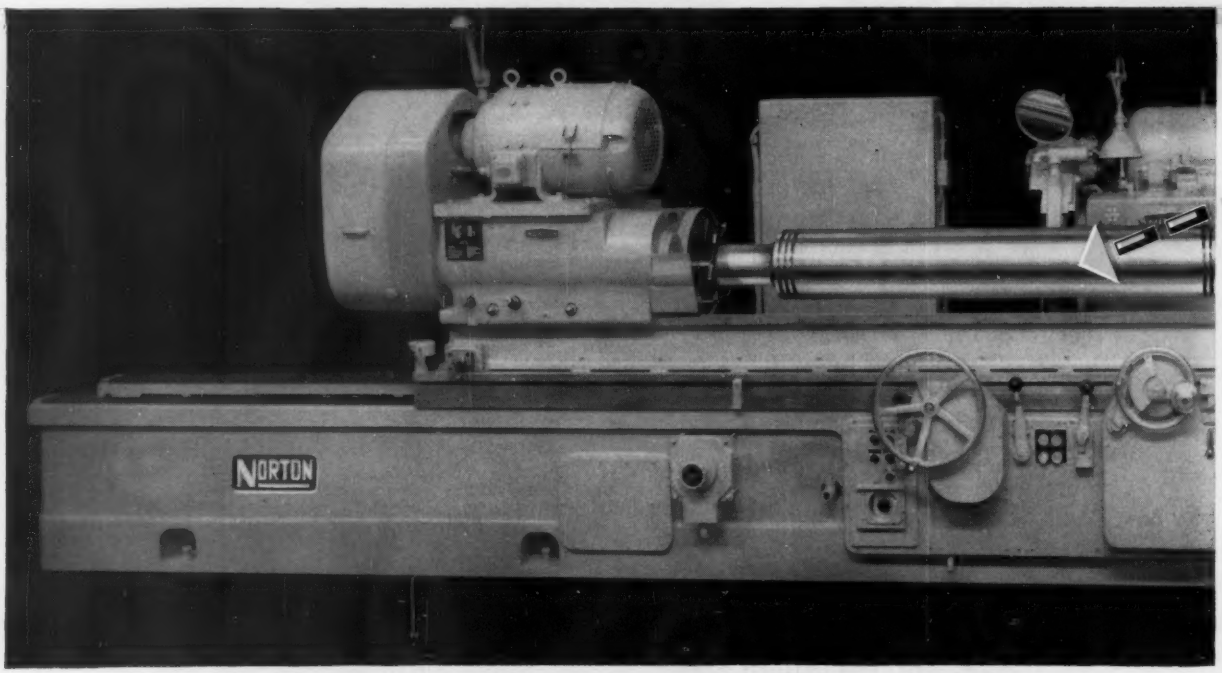
The sequence-of-operations strip pictured above shows how a complete assembly is produced on the U. S. Multi-Slide without secondary operations. The finished assembly is an automotive fastener comprised of a sheet metal stamping and a nut. The stamping is produced on the U. S. Multi-Slide and the prefabricated nut is hopper-fed into proper position for automatic assembly. The complete unit is produced at the rate of 100 per minute—without handling.

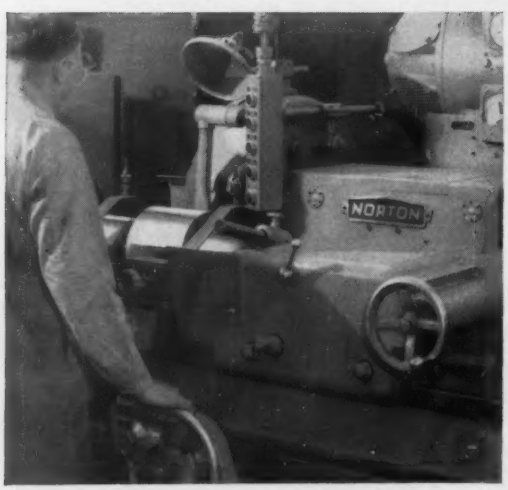
The elimination of secondary operations results in reduced cost per piece, an all-important factor in today's competitive market. If you produce stampings and are interested in low piece part costs, why not investigate the use of U. S. Multi-Slide Machines? Ask for Bulletin 15-M giving complete specifications.

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

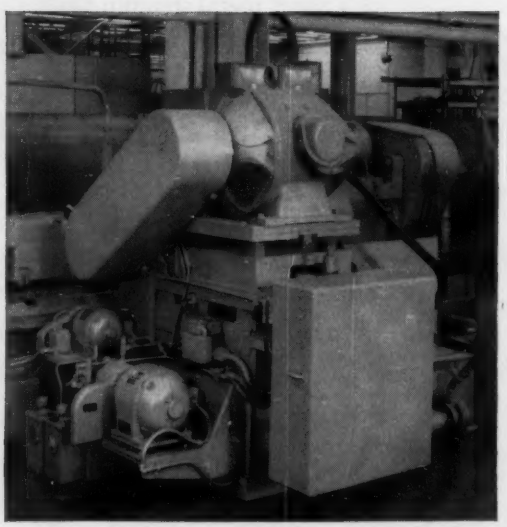
For more information fill in page number on Inquiry Card, on page 257

Here's a heavy duty grinder





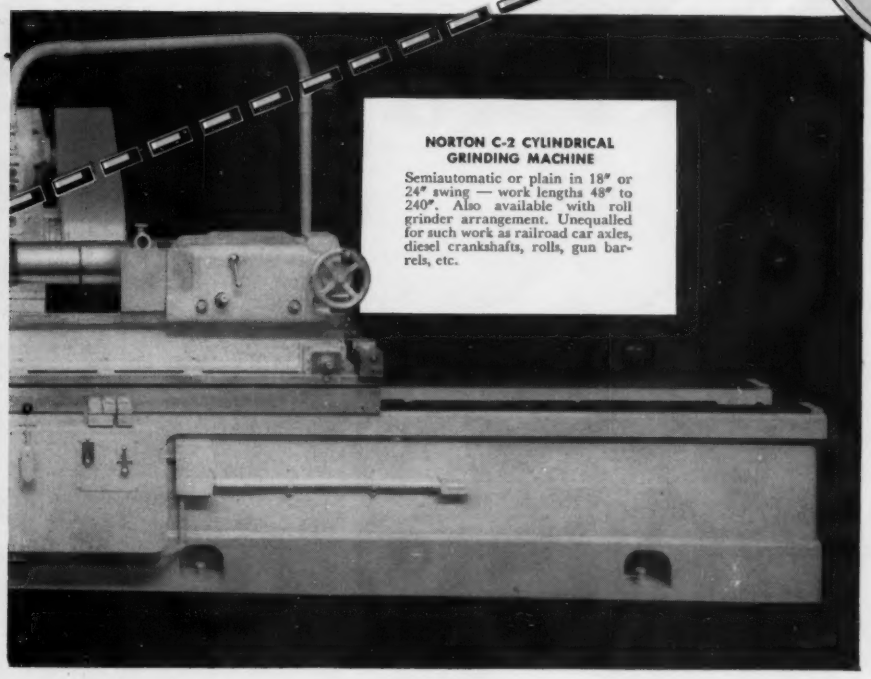
Easy To Set Up And Operate. All controls in front for minimum set-up time, quick change-over and no reaching by operator. Graduated wheel hand feed indicates feed. "Click-counter" signals adjustment for each .0001″ reduction in work diameter. Table-truing and grinding speeds may be pre-set, and obtained by selector lever.



Easy To Maintain. All maintenance points on outside. Pumps, motors, filters, lubrication valves and all reservoirs easily accessible. Electrical controls grouped for easy inspection and enclosed for protection.

that can produce

bigger profits for you


NORTON C-2 CYLINDRICAL GRINDING MACHINE
Semiautomatic or plain in 18" or 24" swing — work lengths 48" to 240". Also available with roll grinder arrangement. Unequalled for such work as railroad car axles, diesel crankshafts, rolls, gun barrels, etc.

The new Norton C-2 Cylindrical Grinder is available in 3 arrangements: Plain Semiautomatic Roll

Faster cutting . . . quicker set-up . . . easier operation . . . less down time

This is the kind of grinding machine you expect from Norton — one that's tops for accuracy, production rate and ease of operation.

The new C-2 gives you more heavy production because it works more of the time — and works faster and easier.

When arranged for Semiautomatic operation all your operator does is to move a single lever for automatic grinding to exact size and finish.

When arranged as a Roll Grinder the famous Norton tilting wheel head mechanism is supplied. This moves the grinding wheel contact point away from or toward the axis of the roll as the roll is traversed past the wheel face.

Remember: only Norton offers you such long experience in both grinding wheels and machines, to help you produce more at lower cost.

Your Norton Representative will be glad to give you all the facts on the new C-2 and to discuss your grinding problems. Or write direct to NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

District Sales Offices: Worcester • Hartford • New York (Teterboro, N. J.) Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

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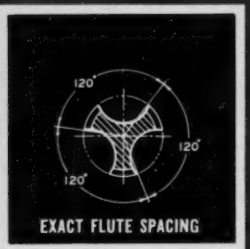
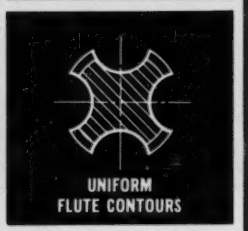
WINTER

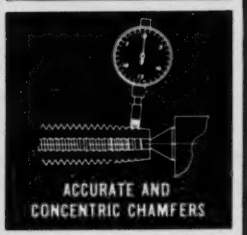


EXACT FLUTE SPACING



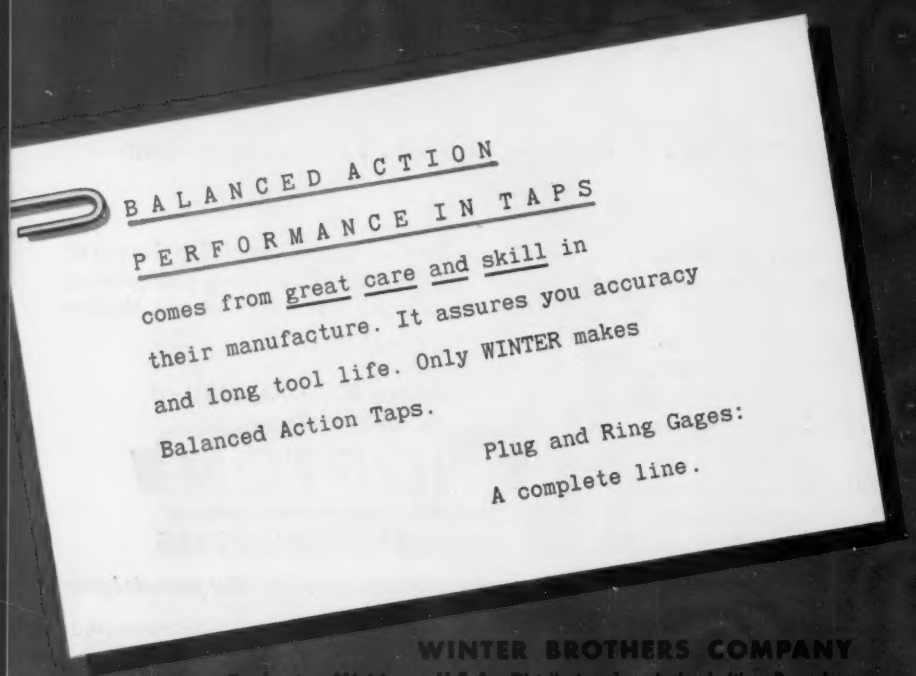
UNIFORM FLUTE CONTOURS

PRECISION CHIP DRIVER CONTOURS



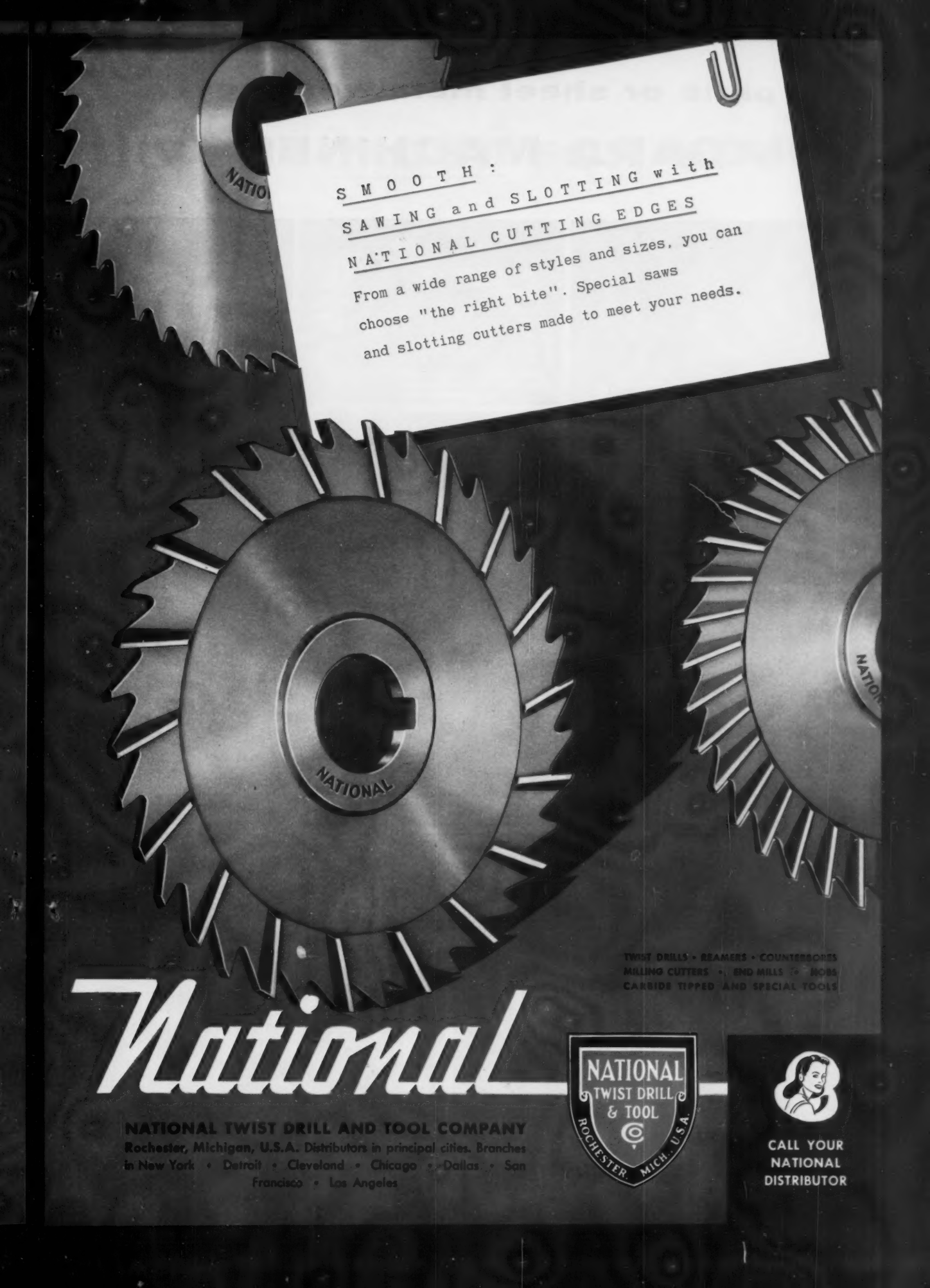
ACCURATE AND CONCENTRIC CHAMFERS

CALL YOUR WINTER DISTRIBUTOR


BALANCED ACTION
PERFORMANCE IN TAPS
comes from great care and skill in
their manufacture. It assures you accuracy
and long tool life. Only WINTER makes
Balanced Action Taps.
Plug and Ring Gages:
A complete line.

WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A., Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles • Division of National Twist Drill and Tool Co.


SMOOTH:
SAWING and SLOTTING with
NATIONAL CUTTING EDGES
From a wide range of styles and sizes, you can choose "the right bite". Special saws and slotting cutters made to meet your needs.
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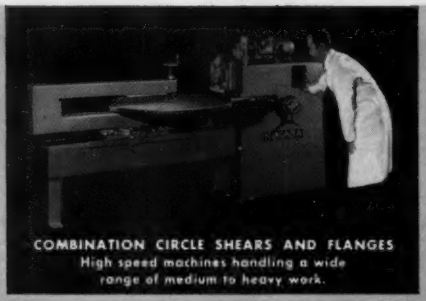
TWIST DRILLS • REAMERS • COUNTERBORES
MILLING CUTTERS • END MILLS • HOBS
CARBIDE TIPPED AND SPECIAL TOOLS
National
NATIONAL TWIST DRILL & TOOL
ROCHESTER, MICH., U.S.A.
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles
CALL YOUR NATIONAL DISTRIBUTOR

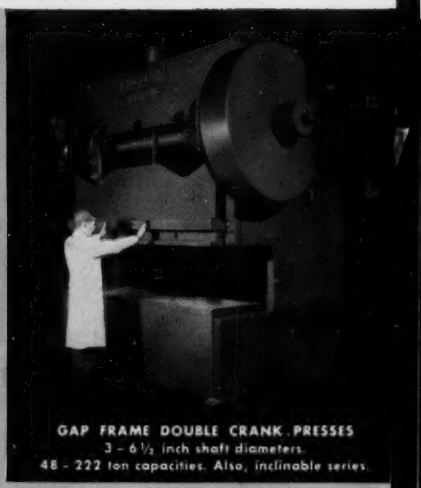
In plate or sheet metalworking...

NIAGARA MACHINES CAN

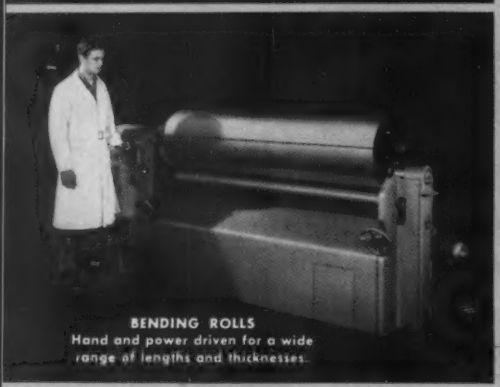
PRESS BRAKES
50 - 775 ton capacities.



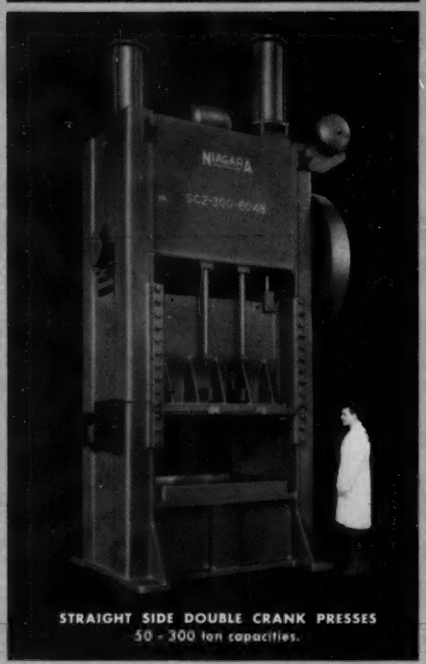
COMBINATION CIRCLE SHEARS AND FLANGES
High speed machines handling a wide range of medium to heavy work.



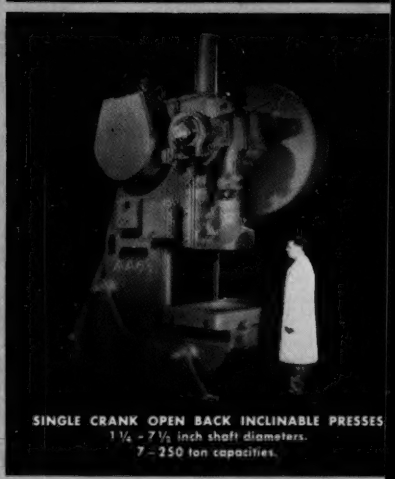
GAP FRAME DOUBLE CRANK PRESSES
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series.



BENDING ROLLS
Hand and power driven for a wide range of lengths and thicknesses.



STRAIGHT SIDE DOUBLE CRANK PRESSES
50 - 300 ton capacities.

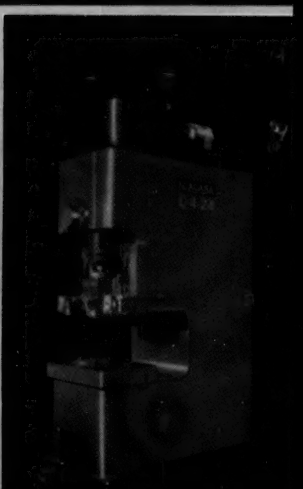


SINGLE CRANK OPEN BACK INCLINABLE PRESSES
1¼ - 7½ inch shaft diameters.
7 - 250 ton capacities.

STRAIGHT SIDE ECCENTRIC GEARED PRESSES MODIFIED AND EQUIPPED FOR AUTOMATION
1, 2 and 4 point suspension.
100-1000 tons.

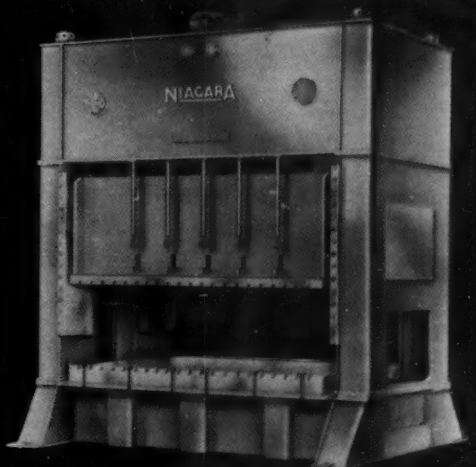
FRONT-TO-BACK CRANKSHAFT OPEN BACK INCLINABLE PRESSES
Standard and automation models.
75-200 tons.

FRONT-TO-BACK CRANKSHAFT ADJUSTABLE BED PRESSES
Standard and modified models.
22-150 tons.

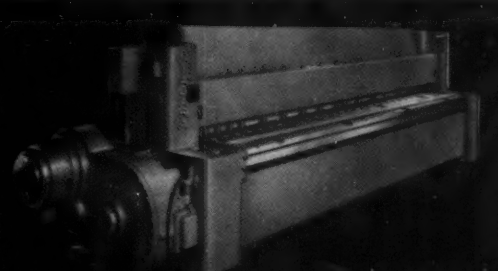


FRONT-TO-BACK CRANKSHAFT DEEP THROAT PRESSES
22-150 ton capacities.

DO THE MOST FOR YOU



STRAIGHT SIDE ECCENTRIC GEARED PRESSES
One, two and four-point suspension.
100 - 1000 ton capacities.



UNDERDRIVE POWER SQUARING SHEARS
Shim stock to 1 inch capacities in lengths from 3 - 20 feet.

NIAGARA

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

POWER PRESSES • PRESS BRAKES • POWER SQUARING SHEARS • ROTARY MACHINES • SLIP ROLL FORMERS • POWER ROTARY SHEARS • DRUM MAKING EQUIPMENT • ELECTRONIC AUTOMATIC WELDERS • GROOVERS AND SEAMERS • HAND OR FOOT OPERATED SHEARS • FOLDERS-BRAKES • LEVER SHEARS AND PUNCHES • HAND TOOLS

✻ MOST EXTENSIVE LINE:

From giant, power-operated machinery to small hand tools

✻ MOST ADVANCED DESIGNS:

Years ahead in performance through forward-thinking engineering

In the world's largest automotive and appliance plants or the smallest of sheet metal shops, Niagara machines and tools are usually at work "in force."

Batteries of giant presses are teamed up with speedy ring and circle shears. Massive, rugged press brakes stand side-by-side with powerful bending rolls and squaring shears. Versatile lever punches, rotary machines, groovers and seamers . . . all operate together to produce a better product at lower cost. The Niagara lines are "companion lines" of metalworking machines and tools that work together. A Niagara-equipped shop or plant is years ahead in quality and volume of production.

Whatever you require — power presses or hand tools — Niagara is the line that can do the most for you. It is the most complete in the industry . . . the most advanced in engineering. You can consult a Niagara representative with complete confidence of unbiased recommendations. Niagara has the right machines and tools for your requirements.

BRING YOUR FILES UP-TO-DATE WITH INFORMATIVE NIAGARA BULLETINS

A diversified and extensive list of machines and tools make up the famous Niagara line. Some of the principal types are illustrated. Be sure that you have the latest data on the ones that apply to your work. At your request, specific Bulletins will be mailed promptly.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

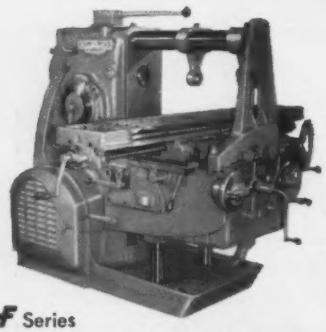
DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

New Kearney & Trecker's

Controls on new TF Series milling machines are conveniently grouped up-front where they belong — to speed production ... assure accurate settings ... reduce operator fatigue



Available under Tool-Lease program

TF Series
Model 210 Plain Milling Machine

POWER — 10hp spindle drive; 3hp feed and rapid traverse drive
TABLE WORKING SURFACE — 62" x 14"
FEEDS — (32) ⅜ to 90 ipm
SPEEDS — (24) 15 to 1500 rpm
WEIGHT — 9200 lbs.

ONE look tells why the new TF Series milling machines — Plain, Universal and Vertical — are so easy to operate. "Bull's-eye" up-front control grouping permits operators to achieve exact settings faster, more adeptly and with greater ease than ever before. This "Fron-Trol" convenience is the key to low-cost production ... because it increases the operator's efficiency and measurably reduces fatigue through elimination of wasted steps.

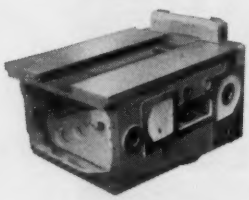
The "bull's-eye" knee and saddle-mounted controls are safety-interlocked and include feed selection, directional Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, front-mounted table handwheel, saddle clamping gib and backlash eliminator, and hand and power directional controls for knee and saddle movements.

In addition, the new TF's give you a superior combination of outstanding design and operating features never before available on any other knee-type milling machines. They're built in five sizes — No. 2 to No. 6 from 10hp to 50hp.

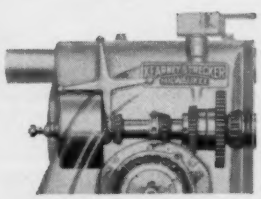
Why take less than the latest when you want new milling machines? You can get all the facts on new TF Series machines from your Kearney & Trecker representative—call him or mail the coupon to factory today!

A few more of many reasons why TF Series milling machines are so easy to operate

Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of the new machines' much larger, wider, heavier knee, saddle and table. This balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts... halves the wear factor, assuring greater, longer-lasting accuracy.



Heavier, Wider, One-Piece Knee — The *Twin-Screw* arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . longer-lasting accuracy.

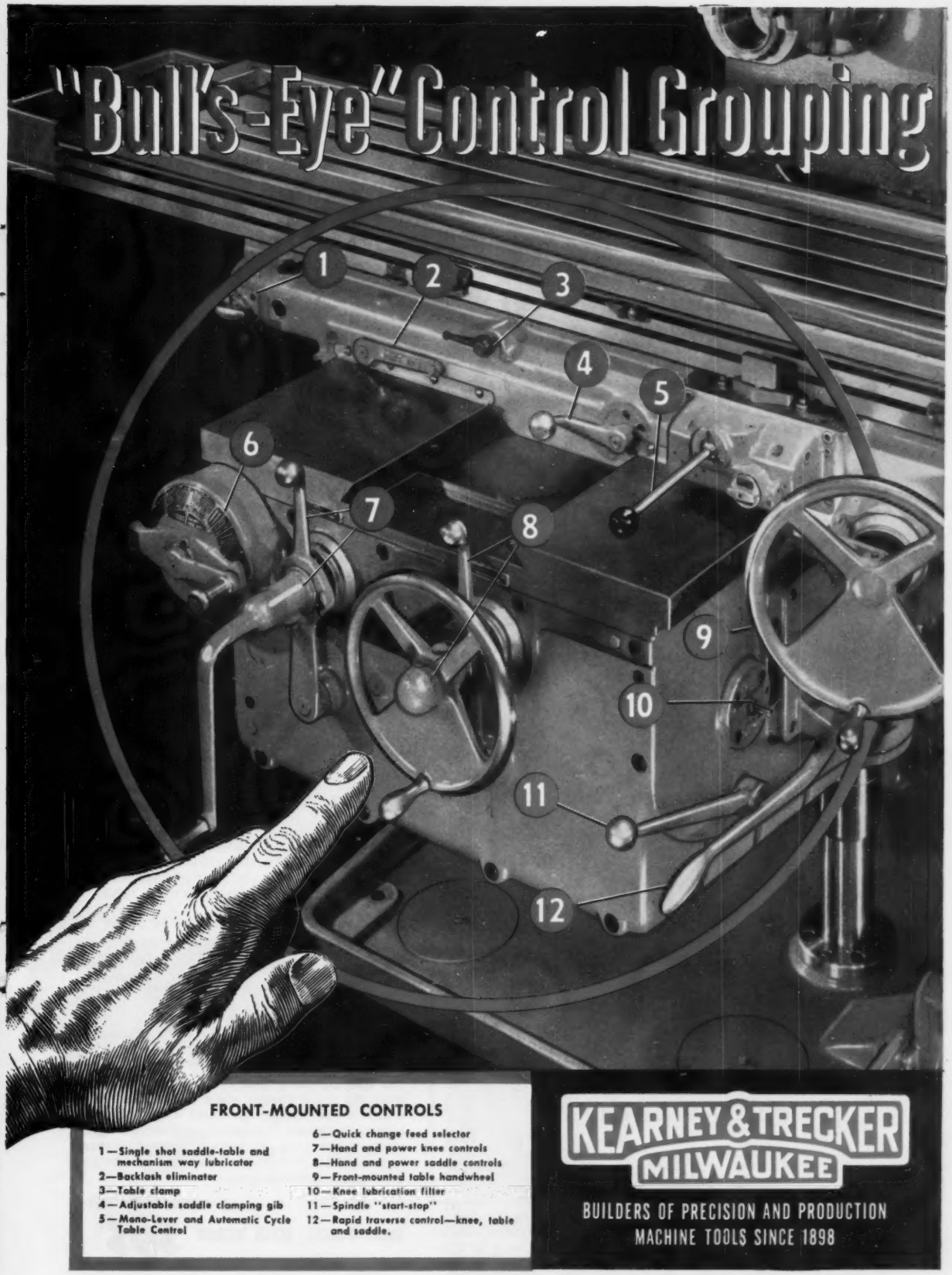


Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life and quieter operation.

KEARNEY & TRECKER CORP.
6[illegible] W. National Avenue, Milwaukee 14, Wisconsin
Please send me Catalog No. TF-50 with details on the new line of TF Series Plain, Universal and Vertical milling machines.

Name.....
Title.....
Company.....
Address.....
City.....Zone.....State.....

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, and permits easy access for routine maintenance.



FRONT-MOUNTED CONTROLS

1—Single shot saddle-table and mechanism way lubricator
2—Backlash eliminator
3—Table clamp
4—Adjustable saddle clamping gib
5—Mono-Lever and Automatic Cycle Table Control
6—Quick change feed selector
7—Hand and power knee controls
8—Hand and power saddle controls
9—Front-mounted table handwheel
10—Knee lubrication filter
11—Spindle "start-stop"
12—Rapid traverse control—knee, table and saddle.

KEARNEY & TRECKER
MILWAUKEE

BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

For more information fill in page number on Inquiry Card, on page 257

Set them, forget them—they stay tight

New high torque Unbrako self-locking socket set screws

Research has proved that the tighter you seat a set screw the better it works. So we designed a set screw that can be tightened tighter than ever before. We formed a deeper socket. We put a radius in the socket corner. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. All this, plus the well-known self-locking knurled cup point that keeps it tight.

Let's see what the changes in the UNBRAKO socket mean to you. The deeper socket gives you more purchase with the wrench. Since more wrench can be put in the socket, you can tighten the screw much tighter. And you won't ream the socket or round the corners of the wrench. The radius in the UNBRAKO corners eliminates the sharp corners where cracks start. Ordinary socket screws have sharp corners which often crack even at torques much lower than those recommended for UNBRAKOS.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

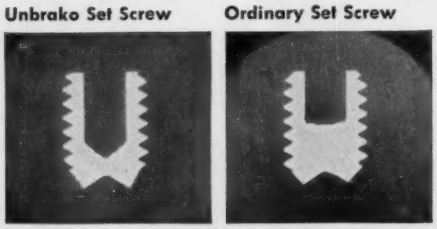
Up to 40% higher tightening torque— a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

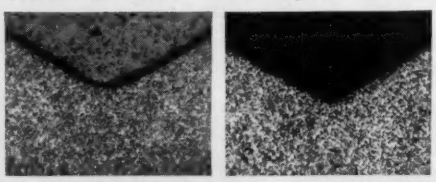
ALL UNBRAKOs can withstand higher tightening torques than ordinary socket set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary socket set screw.

Unbrako Set Screw **Ordinary Set Screw**



COMPARE the socket depth. The UNBRAKO socket at the left is much deeper than the socket in the ordinary set screw at the right. This additional depth in the UNBRAKO socket gives you more purchase with the wrench—you can set an UNBRAKO much tighter.

Unbrako Set Screw **Ordinary Set Screw**

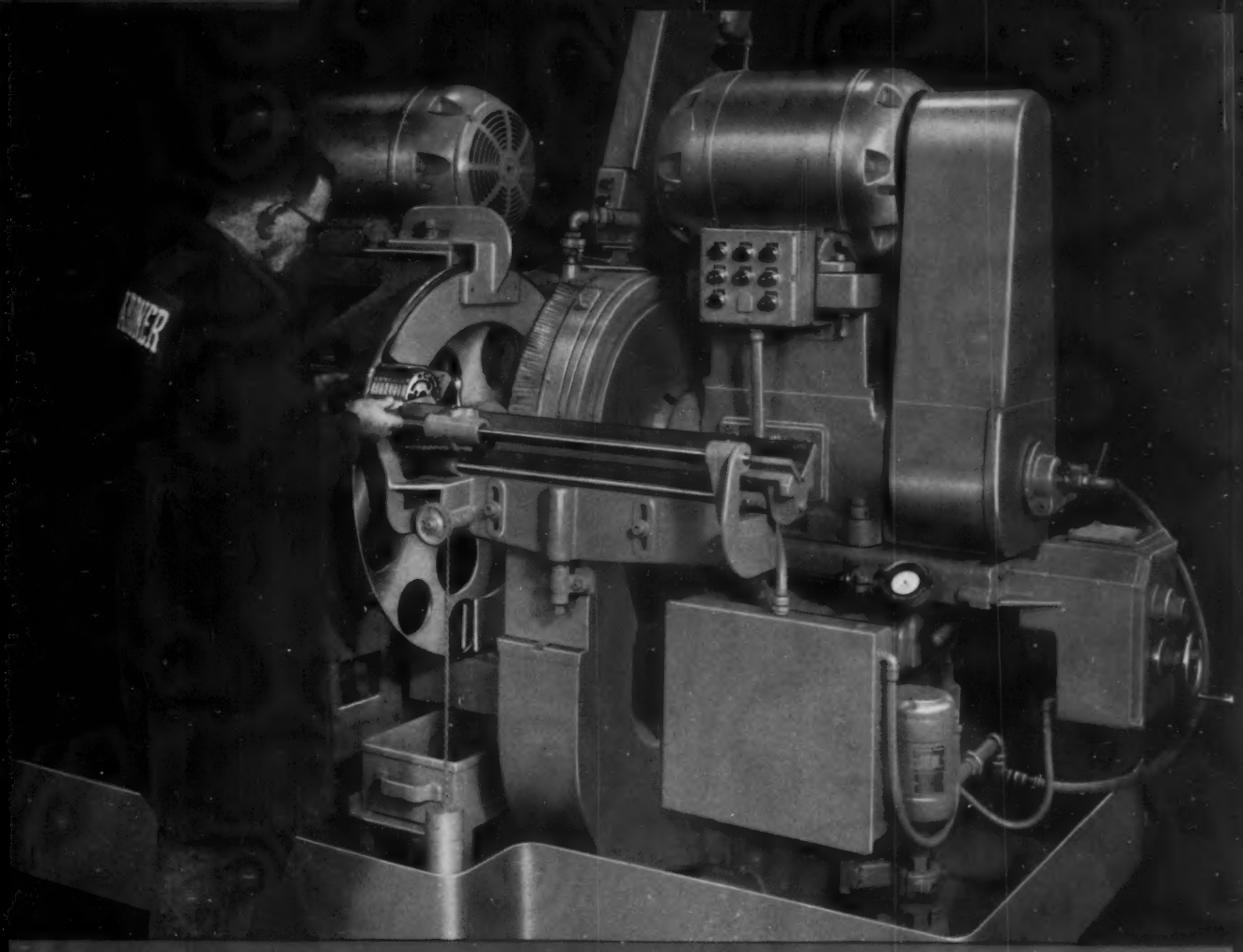


THE RADIUS put in UNBRAKO socket corners eliminates the sharp corners where cracks start. They distribute the stresses developed when tightening torques are applied. You can seat an UNBRAKO tighter without screw failure. Ordinary set screws have sharp corners which often crack when tightened even at lower recommended torques.

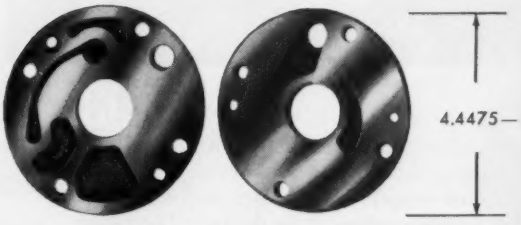
STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

For more information fill in page number on Inquiry Card, on page 257

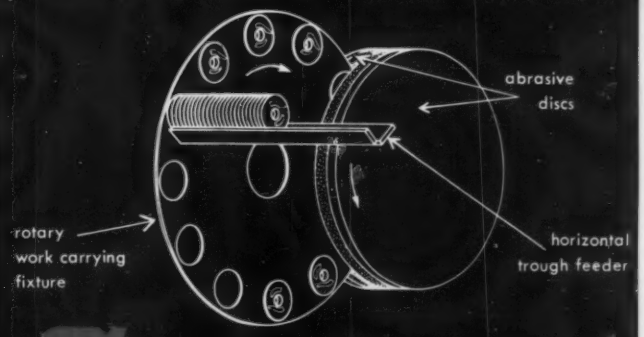


Grinds 1200 flat surfaces of unequal area per hour



Cast iron oil pump cover

Grinds **TWO** parallel surfaces in **ONE** operation

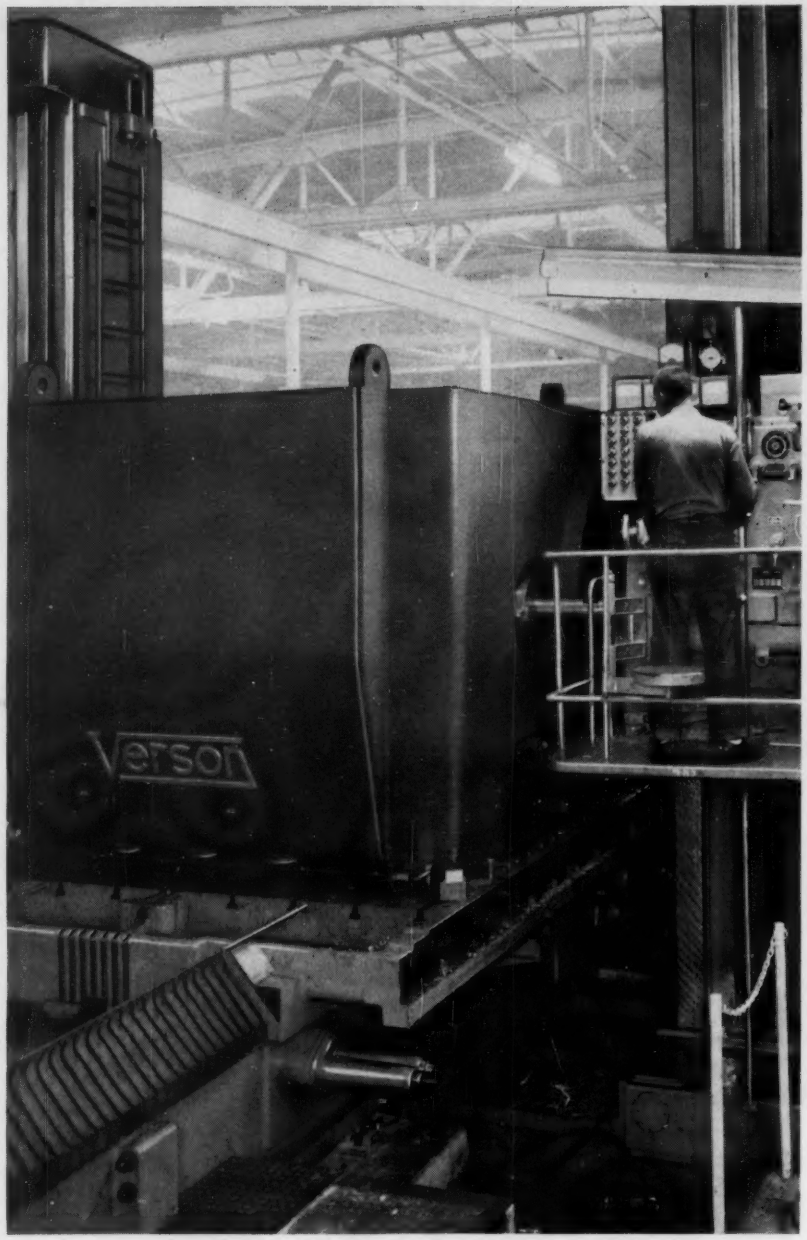


GARDNER

precision disc grinders

BELOIT, WISCONSIN

28½-ton crown for 800-ton VERSON PRESS machined 66% faster on G&L's Planer Type Horizontal



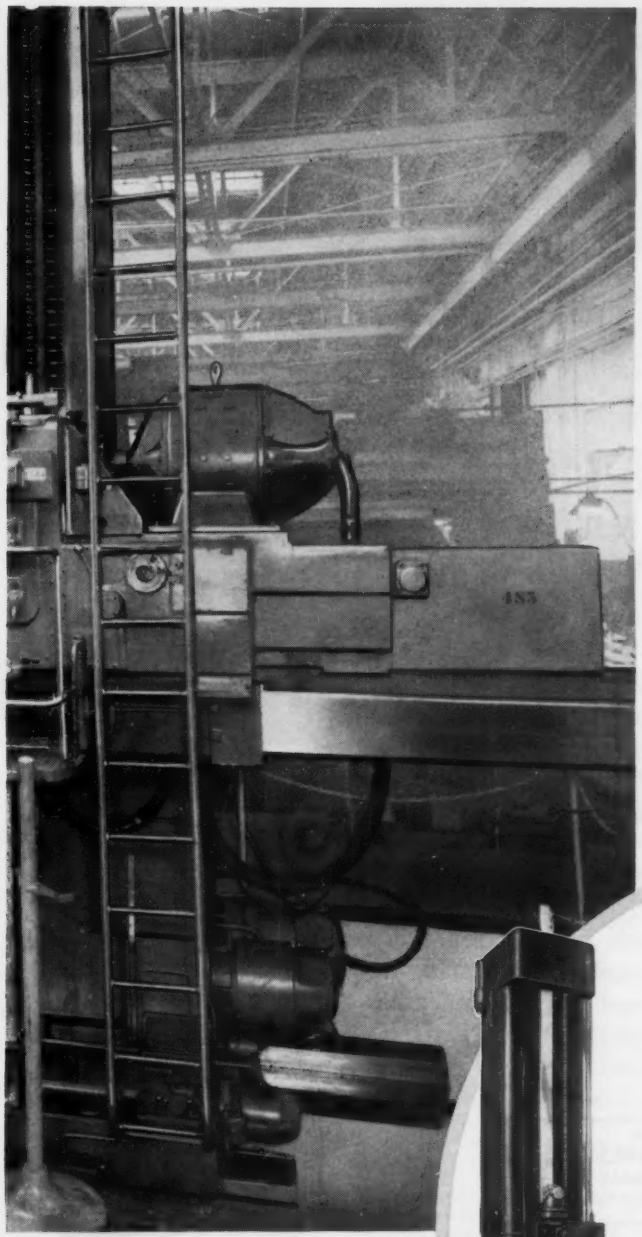
HERE'S an example of large machining operations performed faster and at lower cost on a Giddings & Lewis Model 560-P Planer Type Horizontal Boring, Drilling and Milling machine. And faster production at lower cost is the best reason in the world why you'll find this highly versatile machine at Verson Allsteel Press Co., Chicago, as well as in other leading metalworking plants everywhere.

Here, this dependable, precision-built, two-spindle machine mills, bores and faces a huge 28½-ton welded mild steel press crown — the upper section of an 800-ton mechanical Verson Allsteel press. The crown is 99" high, 115" wide and 145" from front to back. All the machining operations are performed in a record time of 40 hours (including three setups) — 66% faster than ever before.

For complete information on the design and operating features of Planer Type Horizontal Boring, Drilling and Milling machines, see your nearest Giddings & Lewis representative. He'll be glad to give you all the details and tell you what these versatile machines can do for you.

Literature Available

Ask for Catalog No. 50-P with details on 50 Series Planer Type Horizontal Boring, Drilling and Milling Machines.



Giddings & Lewis Planer Type Horizontal Boring, Drilling and Milling machines offer you the features that increase output . . . cut production costs.

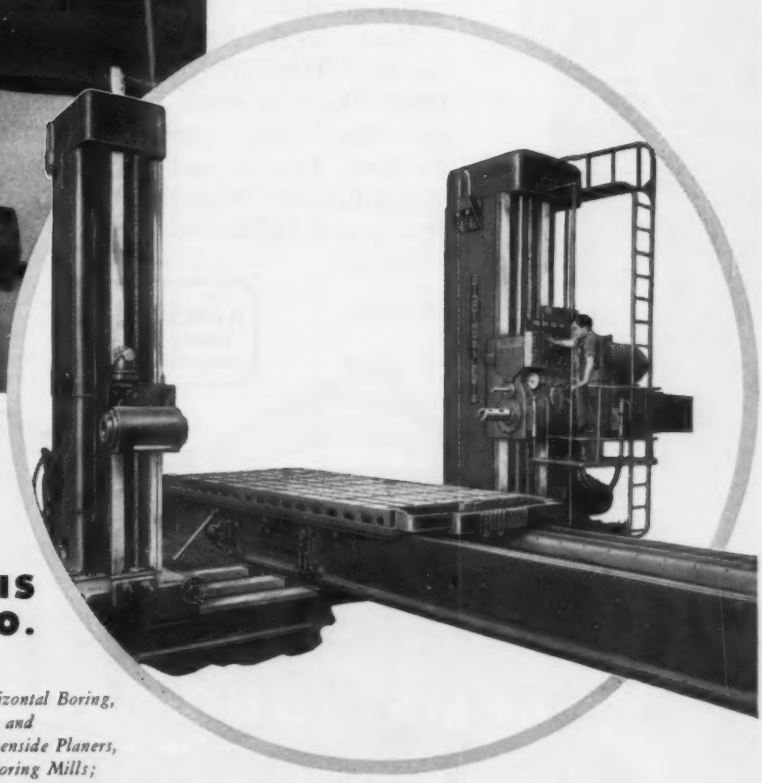
VIBRATION-FREE — Massive, cross-ribbed column, rugged end support, heavy-duty box-type table and balanced headstock design assure vibrationless machining—maintain exacting accuracy at highest speeds under heaviest cutting operations.

DEPENDABLE CONTROLS — Portable and fixed headstock control stations allow full control over all functions within complete working range. Controls are grouped conveniently for easy selection by the operator.

PERFECT LUBRICATION — Motor-driven pumps provide ample lubrication to all bearings . . . pressure lubrication to shifting clutches, the hydraulic clamps of headstock to column and column to runway. Separate pump delivers heavy-duty lubricant to way surfaces.

SAFETY SWITCHES — Electrical safety devices control all movable units of machine — especially for prevention of over-travel by disengaging the feed and rapid traverse whenever extreme limits are reached.

COMPLETE LINE—Planer Type Horizontals are equipped with a wide range of feeds and speeds for main and auxiliary spindles, and heavy-duty spindle underarm support on larger machines. They're available in 10 standard Models and three different Series. Spindle diameters 5" to 14"; motor drives from 40 to 150 hp, 600/1800 rpm; various capacity-increasing optional attachments and accessories.



G-57

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

For more information fill in page number on Inquiry Card, on page 257

ARMSTRONG

T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID JACKS

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS

STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

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Want to put your plant on a bed of roses?

You can—easily! Switch to CIMCOOL°, the radically new and different cutting fluid that has become, in just a few years, the largest selling chemical cutting fluid in the world.

Here are just three of many reasons why CIMCOOL Concentrate gets all the bouquets:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL INCREASES TOOL LIFE** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So if you want to see your production picture take on a rosy hue, put CIMCOOL on the job in your plant. Let us give you the full details on CIMCOOL Standard Concentrate—and on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive**—For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

WHY 88 SHOPS BOUGHT ...before the

SHOP A REPORTS:

Greater Precision! "We found in our shop that on large diameter cylinder work our hand-operated machines were no longer providing the high degree of accuracy needed. Since installing 2 AC's, we are consistently holding 40 micro-inch finishes and .0005" tolerances, because the cutting tools are held close to the pentagon turret, minimizing tool overhang."

SHOP B REPORTS:

Fast Pay-off on Small Lots! "Not until we installed a pair of 2 AC's did we fully appreciate their fast setup features and efficiencies on small lot work. One part, in 58-piece lots, took 15 minutes on hand machines—now only 5 minutes on the 2 AC. Another 70-piece lot took 20 minutes per piece—now 7 minutes. Multiply these savings over a range of small lot work and you'll understand why our 2 AC is paying itself off fast!"

SHOP C REPORTS:

Ample Metal Removal Capacity. "A recent sub-contract job called for machining a lot of 5⅛ dia. x 9½ long 1050 steel slugs weighing 54 lbs. each. They required some heavy duty machining—large diameter drilling, counterboring, turning, undercutting and forming. Hand machine time had been 2 hours 40 minutes per piece. Our 2 AC cut cycle time to 52 minutes, removing 20 lbs. of metal per piece. Maximum rigidity has certainly been designed into the 2 AC!"

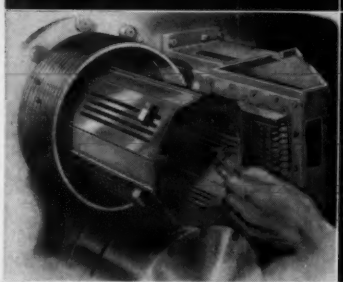
SHOP D REPORTS:

Floor Space Savings. "A production efficiency study and turning department survey indicated the need for rearrangement of manufacturing facilities, for smoother work flow, and additional modern equipment. Floor space was limited. Additional turret lathes would have to be placed outside the turning department, and would disrupt the work flow pattern. Adding 2 AC's—producing an average of 2 to 1 over turret lathes—solved our problem. They gave us the extra capacity needed within the turning department."

SHOP E REPORTS:

Uses Standard Turret Lathe Tooling "When we installed our 2 AC's we purchased only a minimum of standard tools. We found the majority of our turret lathe tools were interchangeable. Our initial tooling investment was therefore substantially reduced. And now it is easy, too, for one operator to tend two machines, consistently producing over 4 times as many pieces with less effort —all of uniform quality, with no scrap loss, and at lower cost."

ACCURACY—Spider and massive overhead guide plate insure positive indexing accuracy. Integral construction of pentagon turret and spindle bearings assures precision tolerances from morning till night.



FAST SETUP—Speeds, feeds, stroke length, dwell, cross slide selection, etc., are quickly and easily obtained merely by setting adjustable trips on the selector drum and installing operating screws on the index drum. No cams to change.

GREATER RIGIDITY—Only two, widely spaced bearings support the one-piece forged steel pentagon turret bar. Overhead turret design places tools closer to guiding ways on large diameter work for maximum rigidity and accuracy.

1 AC
8" or 10" Chuck
6" Working Stroke

2 AC
10" or 12" Chuck
9" Working Stroke

COMPLETE DATA AVAILABLE ON REQUEST

WARNER & SWASEY 2 AC's *first one was even built!*

TWO YEARS AGO 88 buyers placed their orders, based on their confidence in the *proven* Warner & Swasey design principle behind this new automatic.

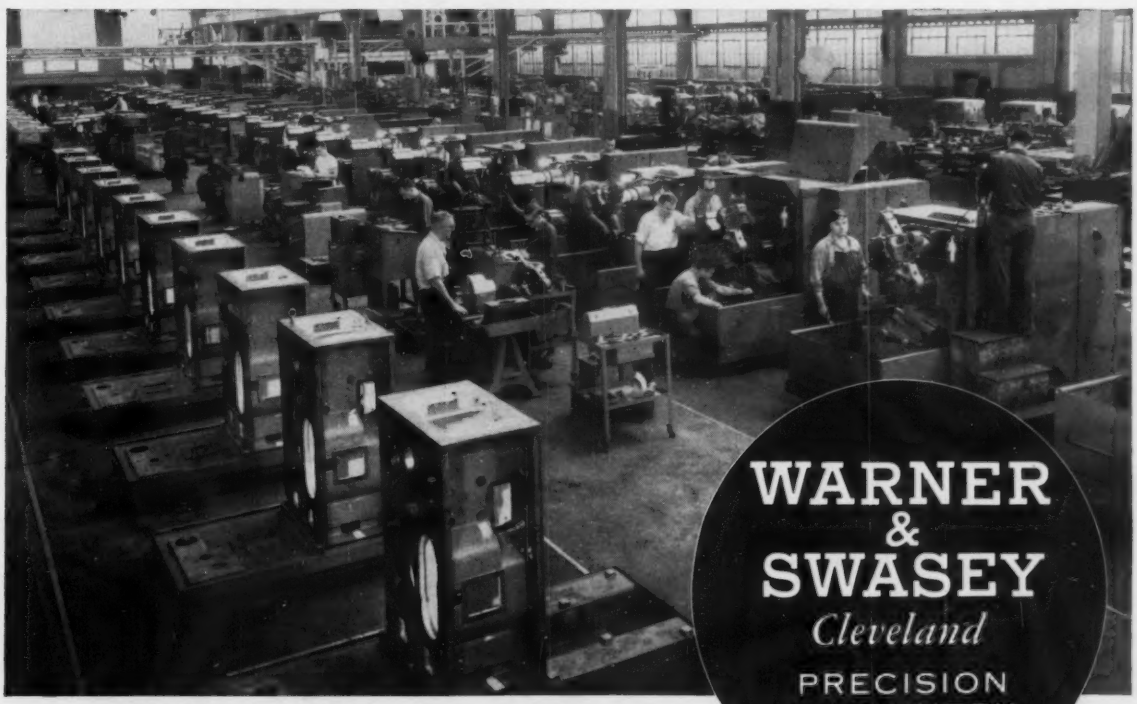
For its smaller predecessor—Warner & Swasey's 1 AC—had *proved* its value in plants throughout the land.

Today this confidence has been substantiated by the 2 AC's field performance. And we are doing our best to meet the increasing demand for these machines.

Both Warner & Swasey Single Spindle Automatics are designed for *fast setup,* like a turret lathe. This makes it possible to profitably machine *turret lathe lots,* but on an automatic basis. They use many *turret lathe tools* —provide the *flexibility* of a turret lathe—*accuracy* beyond traditional automatic performance, but require less skilled operators to achieve that accuracy.

These automatics put more finished pieces on the floor every day, because they turn all surfaces at the right speeds and feeds, regardless of the length of the cut, and virtually eliminate operator fatigue.

Take a look at owners' comments. If one suggests a production improvement for your shop, call in your Warner & Swasey Field Representative—get the facts on how Warner & Swasey Single Spindle Automatics can pay off for *you.*



AND ORDERS CONTINUE TO COME IN! It's a "capacity house" on the 2 AC production line in the Warner & Swasey plant. We're turning out 2 AC's as fast as high precision machine production permits.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

For more information fill in page number on Inquiry Card, on page 257

Some of the thousands of varied parts formed on the Steelweld Press. These involve bends and curves of every description in many plate thicknesses. Bars of heavy cross-section, usually requiring a bulldozer, are formed into semi-circles for gear rims and similar uses.

800 Tons of Plate Formed Monthly

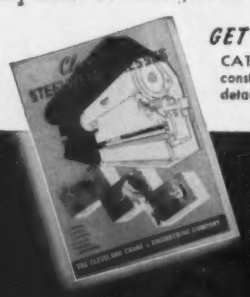
STEELWELD PRESS *Produces* Infinite Variety of Curves and Bends

This Steelweld Press is rated at ½"x14'-0" mild steel. With the 24-inch bed and ram extension at each end, it will bend plate that can clear by the 18-inch deep throat to 18'-6" long. Two cross shafts with foot pedals are provided for operating the press. The lower shaft is for normal operation while the upper shaft brings the reversing flywheel into action to back the ram off the work whenever desired.

EVERY month some 800 tons of plate of all thicknesses to one-half inch is formed with bends and curves of every description on a Steelweld Press. The machine is in operation nine hours a day.

Since parts formed are produced in very small duplicate quantities, the dies and machine settings usually must be changed many times during a day. Because of the ease with which Steelweld Presses can be set up, the operators can do this quickly and easily.

Steelweld Presses offer so many advantages that we urge you to write for the catalog below and get all the facts on them. Hundreds of these machines are now in use for bending, forming and punching operations of every description.



GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
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Wickliffe, Ohio

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BENDING PRESSES
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Got a pain in the neck?

IF GRINDING PROBLEMS ARE GIVING YOU A PAIN IN THE NECK, SWITCH TO CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

And we're definitely not sticking out our neck when we make these claims, because through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.* So, we think you'll agree it's worth investigating CINCINNATI (PD) WHEELS right away.

Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

(PD) POSITIVE DUPLICATION.
°Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

CINCINNATI° *Grinding Wheels*

to cut machining costs

machine faster with

Continuous Broaching

■ Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

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Cleveland 8, Ohio
Detroit Office: General Motors Building

☆engineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

PRE-SET TOOLS IN MAGAZINE-TYPE TOOL BLOCKS SPEED CHANGE-OVER

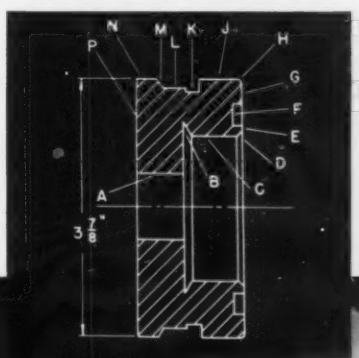
Six Different Part Sizes Handled with Minimum Tool Setting Required

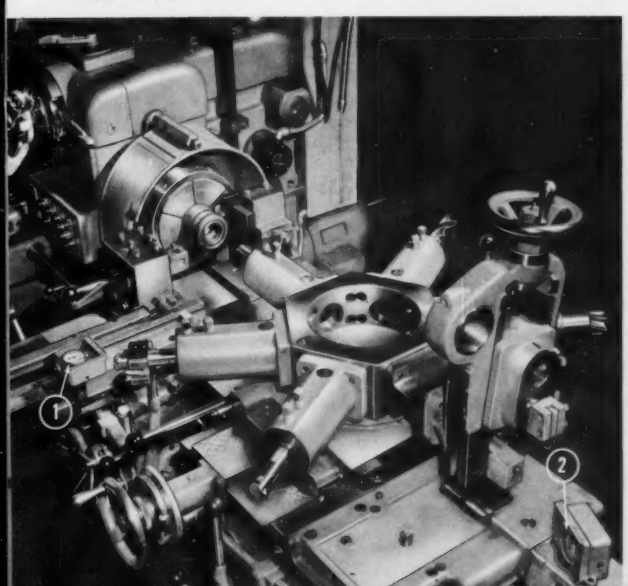
Here is a business-like setup, for producing various sizes of neck ring molds from 17″ long cored cast iron billets. The billets have been rough turned and cut in half prior to this machining operation.

This setup is on a 3⅞″ diameter neck ring mold. Surfaces A-B-C-D-F-J-N are machined from the hexagon turret. Critical lengths are easily held, using a "tenth" indicator on the turret saddle. Surfaces E-G-H-K-L-M are handled from the front of the bridge-type cross slide, with multiple tools held in a longitudinally adjustable magazine-type tool block. The tools are hand fed to depth with close dimensions checked by a second "tenth" indicator. Cut-off is at P from the rear of the cross slide. Floor-to-floor time is 10.3 minutes.

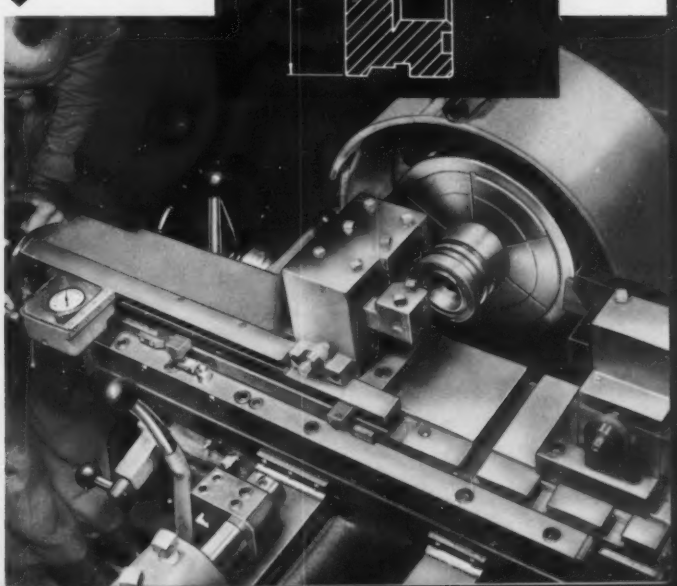
The spindle on this sturdy Gisholt 1L Saddle Type Turret Lathe has a special 7″ pilot bore, for a depth of 18″ and a 15″ spindle nose. Thus the work is rigidly supported, back in the spindle, while machining is performed. A special collet chuck is used, with an air-operated pusher arrangement to feed the stock and an air blast in the bore to clear the jaws of chips before each new billet is inserted. A six-section master collet provides the necessary flexibility for chucking the six part sizes.

Tools in magazine-type tool blocks are ground and pre-set to gauge in tool room to cut downtime. Tolerances are checked with dial indicators. Special spindle bore saves cost of larger capacity machine.





Finished part being cut off from rear of bridge-type cross slide. Note "tenth" indicators mounted at (1) and (2).



Pre-set tools in magazine-type tool block are hand fed to depth as dial indicator provides visual tolerance check.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

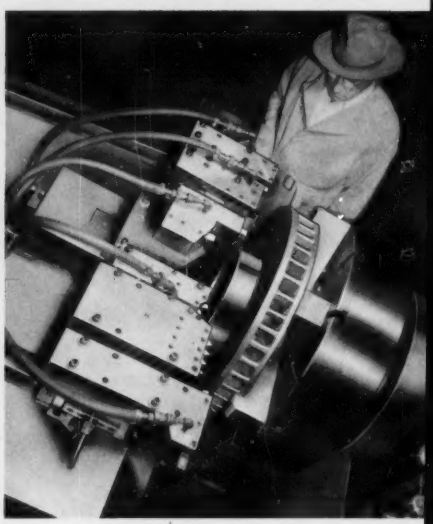
14 TOOLS MACHINE 11 SURFACES IN ONE OPERATION

Features Table Feed and Two-Speed Motor Arrangements

This job is tailor-made for the rugged Gisholt Simplimatic Automatic Lathe. Tooling is planned for fast change-over, since machining operations on both sides of these 28" diameter, 6½" wide cast iron rotors are handled.

The second operation is shown. After chucking, the extra-wide platen table traverses the tooling to the work, and then changes to feed as the flange O.D. is turned with the tool at the rear while the facing tools on the rear slide are plunged to depth. Then, the rear slide feeds transversely with four tools dividing the rough cut across the flange face as others face and co-bore the hub I.D. At the same time, the center slide feeds forward to finish size and relieve the hub co-bore, bore the flange I.D. and round the hub and flange edges. As the rear slide tools complete the rough facing cut, the front slide trips the two-speed motor to the "high" side. A single tool finish faces the flange and another rounds the O.D. edge, completing the part. Floor-to-floor time on this job is just 13.8 minutes.

Platen table provides maximum support with minimum overhang to eliminate vibration and improve accuracy. Two-speed motor arrangement on the Simplimatic provides a finer finish, both on the flange face and in the hub co-bore.



Extra-wide platen table carries 3 tool slides. Fourteen tools machine a maximum number of surfaces in one operation.

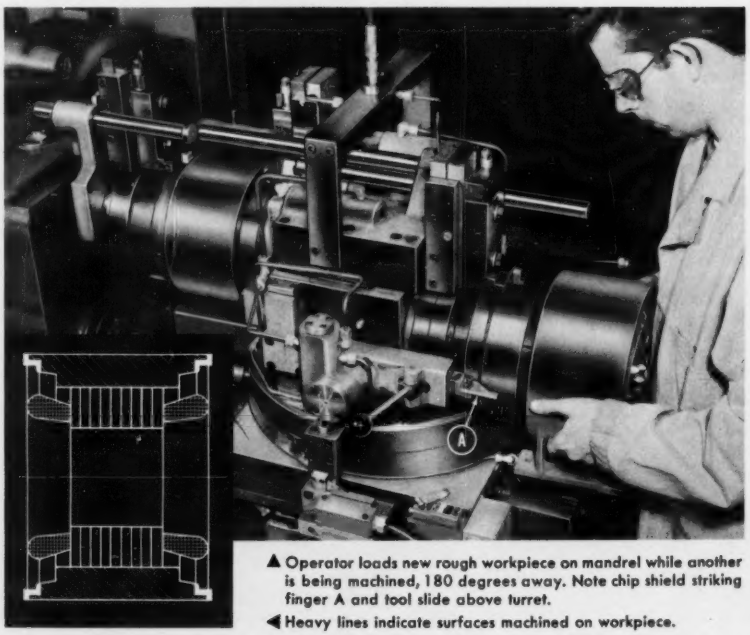
THIS SETUP WHIPS UNPRODUCTIVE TIME

Chips Fly as Operator Loads and Unloads Parts

Here's how rabbet fits on three basic sizes of cast iron electric motor frames are handled at a rate of 120 parts per hour. The machine is a Gisholt No. 12 Automatic Production Lathe, equipped with twin arbors on a special carriage-mounted indexing turret. The operator simply loads and unloads while machining is performed, incorporating former unproductive time into the machining cycle.

The motor frames arrive with windings already in place and the rabbet fits rough machined. The rabbet fit bores range from 8⅜" to 9$^{29}/_{32}$" in diameter. Expanding mandrels hold in stator bores ranging from 3¾" to 6⅞" in diameter. The depth of cut is the same on all parts, so the floor-to-floor time is set at 27 seconds.

Here's the cycle: operator removes finished part and places new workpiece on mandrel. Location is against chip shield striking finger (A) actuating switch, allowing arbor to expand chucking part in I.D. Finger A is retracted, clearing indexing circuit. When part is completed, carriage trips into reverse traverse and, when fully back, indexes 180 degrees and unchucks finished part. Carriage traverses forward, changing to feed as mating teeth on mandrel and spindle flange engage to drive work. Spindle starts. Continued forward feed of carriage engages overhead pusher rod with dead stop actuating tool slide over turret. Slide on turret feeds tool forward as carriage feed moves work into tool mounted over spindle, simultaneously machining the rabbet fits at both ends. As part is completed tools are relieved, carriage trips into reverse traverse and cycle repeats.



▲ Operator loads new rough workpiece on mandrel while another is being machined, 180 degrees away. Note chip shield striking finger A and tool slide above turret.

◀ Heavy lines indicate surfaces machined on workpiece.

With workpieces weighing approximately 50 pounds, this method of loading and unloading has not only increased production by cutting unproductive time but has also reduced operator fatigue.

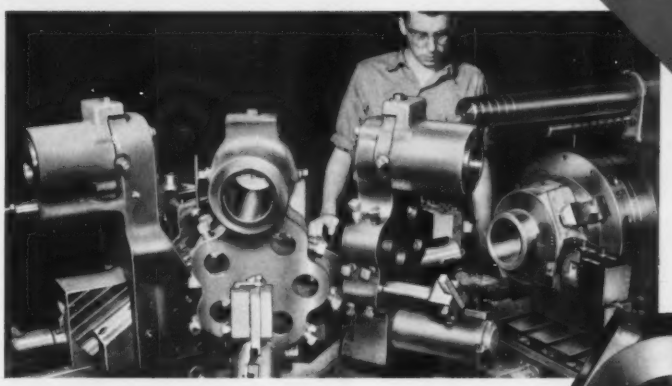
TIME-SAVING IDEAS

AUTOMATIC TURRET LATHE CUTS COSTS ON SMALL LOT OPERATIONS

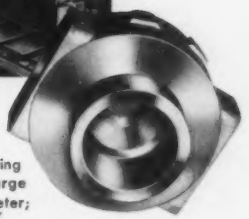
Versatile 2F Fastermatic Minimizes Effort, Shortens Change-over

This manufacturer, with minimum investment, has improved medium-run machining operations on eight different types of pump bodies and housings. The workpiece shown is typical. A pot-type fixture is used, with the part locating against a previously machined face on a locating ring mating with a pilot diameter on the back of the part. Draw-back fingers hold in opposed port openings. The machining sequence is shown by the line drawings. Floor-to-floor time is only 9.40 minutes.

Piloted multiple turning heads provide maximum support and flexibility. Massive tool holders reduce overhang for accuracy and rigidity during heavy cuts. Adjustable block-type cutters speed boring operations and are interchangeable for different bore sizes. Special cross slide cams provide extra travel for facing the larger parts. Adjustable, tee-slotted tops further speed change-over.

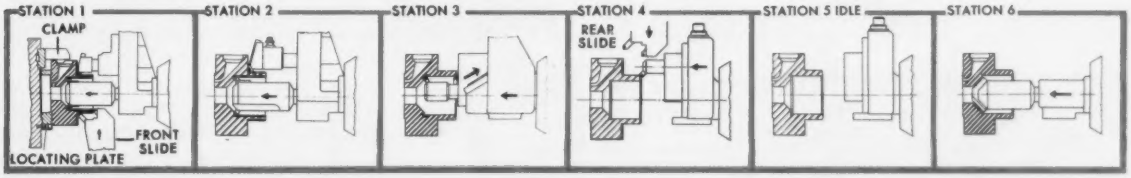


Recess at base of bore is formed by internal facing tool at left, actuated by adjustable stop bar under overhead pilot on headstock.



Pump housing, showing surfaces machined. Large face is 9¾" in diameter; hub diameter is 6½".

Heavy cuts are taken at maximum feeds and speeds with the ease and efficiency offered by automatic operation. Production is fast and quality consistent. During machining, the operator is free to inspect parts or perform other work.

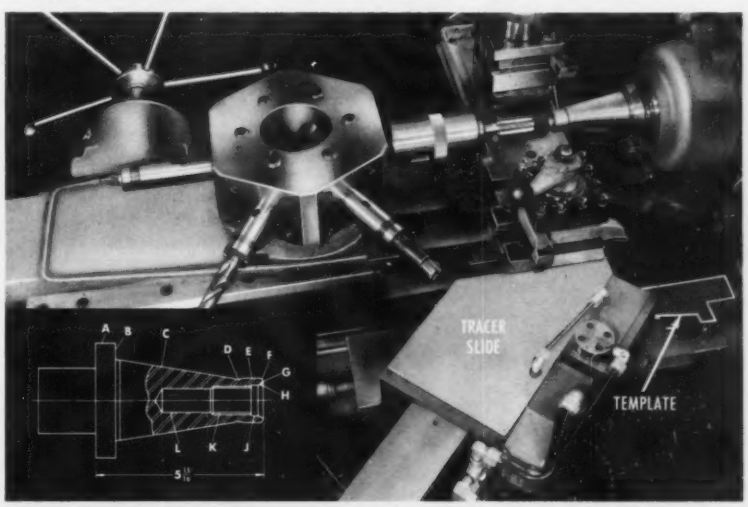


STEPS UP PROFITS ON STEEL END MILL ARBORS

JETracer on Rear of Cross Slide Cuts Costs, Speeds Production

You may get ideas here on cost-cutting with this combination—the new Gisholt MASTERLINE No. 5 Ram Type Turret Lathe with JETracer. Here's how they team up to machine the shank end of tough steel end mill arbor forgings, in only 9.73 minutes floor-to-floor time:

A hydraulically operated collet chuck holds the work. A-B-E-G are rough-machined by square turret tools from the front of the cross slide. The tracer slide carries a quick-indexing type square turret with roughing and finishing tools. In two fast passes, the JETracer rough- and finish-machines G-F-E-D-C-B-A, completing the O.D. The JETracer then retracts out of the way while standard tools on the hexagon turret center drill, drill L, co-bore J, form H and tap K to finish the operation.



This combination provides all advantages of tracer operation, plus unrestricted use of hexagon turret for all additional operations on the I. D. of the piece.

An indexing square turret on the Gisholt JETracer slide permits heavy roughing cuts and a light finish cut with a fresh second tool for close tolerance machining operations.

MASTERLINE GISHOLT SINCE 1887

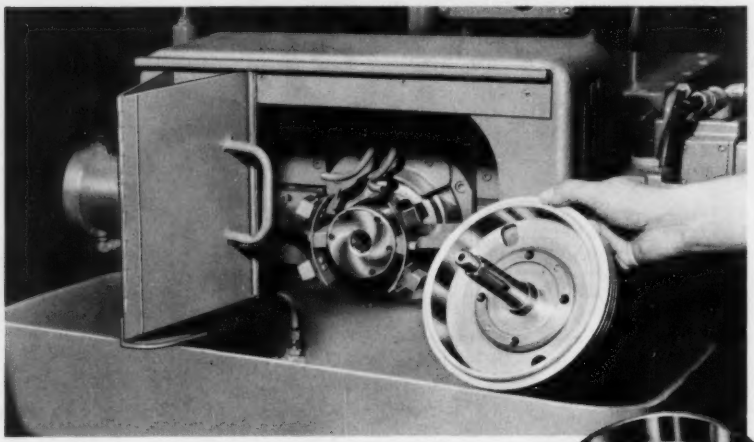
TIME-SAVING IDEAS

GRINDING OPERATION ELIMINATED BY BRAKE DRUM SUPERFINISHER

Brake Drums Superfinished for More Area Contact, Longer Life

By combining expert setup with an advanced process, a leading automotive manufacturer is improving quality, cutting costs and lengthening service life on rear brake drums. The process is Superfinishing—and the machine is a Gisholt Model 57 Brake Drum Superfinisher.

An air-operated collet chuck holds the work on the rear brake drum shaft. Depth stop is an internal plug, with drive against the splined shaft. After rough- and finish-boring, the braking surface is Superfinished down to ten micro inches R.M.S., or less. Floor-to-floor time per unit on this job is only 20 seconds—and savings are realized through elimination of the usual grinding operation.



Gisholt Model 57 Brake Drum Superfinisher, showing workpiece, collet chuck and Superfinishing stones which move out to engage the brake drum I. D.

Time is saved and unit cost is lowered with this setup—and the Superfinishing provides a better braking surface for faster, safer stopping action.

Front brake drum is also Superfinished on second machine.

ADHESIVE LEAD FOIL CORRECTS ROTOR UNBALANCE

Note size of workpiece compared to operator's hand. Sections of adhesive lead foil are cut to size and positioned for ready use.

Unique Method with DYNETRIC Balancer Corrects Lightweight Parts

Here is a dramatic application which demonstrates the extreme accuracy of all standard Gisholt Balancing Machines. This job—handled by a 1S DYNETRIC Balancer with lightweight work supports—is a miniature D.C. motor rotor. The rotating section, a hollow wire winding weighing only 0.637 ounce, rotates about a central heavy core and shaft and requires a two-plane balancing operation.

Loading and unloading are simplified by balancing in an over-hanging position. Belt drive is used to rotate the workpiece at approximately 3000 r.p.m. Correction planes are located on each side of the winding, at a 0.625″ radius from center. The problem of the large parasitic mass of the central core, shaft and arbor is overcome—because Gisholt Balancers amplify unbalance effects electrically. By calibrating the Direct Reading Amount Meter, one unit on the meter is made to represent a ⅛″ x ¼″ piece of adhesive lead foil weighing only .001 ounce. The meter tells the exact amount of correction needed, and the strobe lamp tells the operator precisely where to apply the foil on each side of the winding. While still on the supporting arbor, the part is then corrected and inspected to make sure residual unbalance is less than ½ a meter unit—and the job is completed, in less than one minute f.t.f.!

From the smallest to the largest rotating parts, you'll find a standard Gisholt Balancer available to meet your needs. Write for new general Catalog 1109-B.

DYNETRIC BALANCERS GISHOLT

No. 3-456

654

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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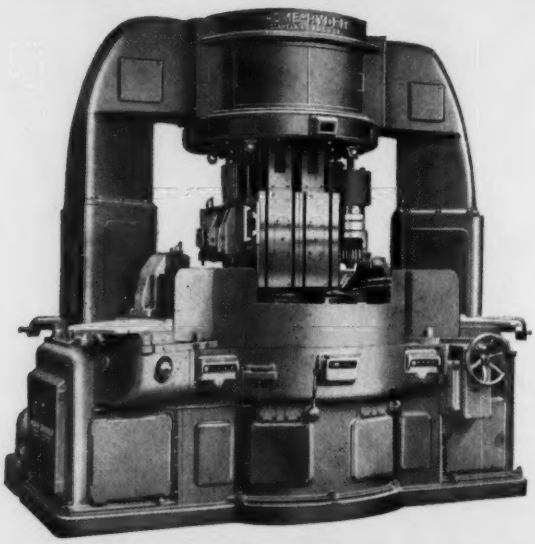
8-SPINDLE VERTICAL HYDRAULIC



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- ★ Four independently-operated cross slides.
- ★ Feed control of all toolslides by positive cam control.
- ★ Eight vertical toolslides for end-working tools and attachments.
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- ★ Operating controls conveniently located at front and rear of machine.

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Introduced by

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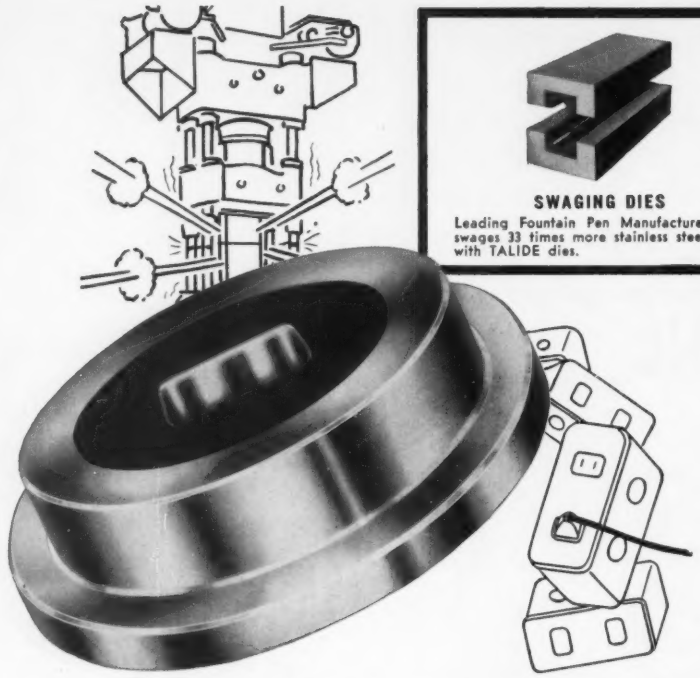
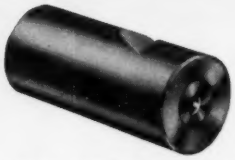
in response to today's **NEED** *for* **SPEED**

also built in 6-spindle, 17-inch capacity



SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

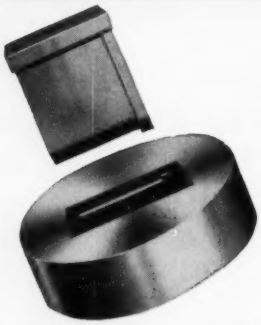


HEADING AND EXTRUSION DIES

Cold-heading 1/4". C-1008 steel rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

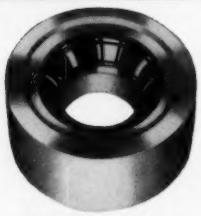
CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.



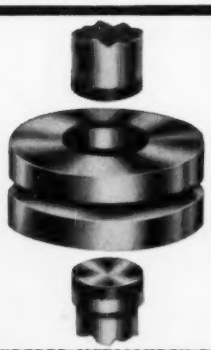
BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE — over hard alloy die.



SHEET METAL DIES

137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.



POWDERED METALLURGY DIES

Compacting highly abrasive chemical powders, TALIDE Pill dies last 4 months, steel dies wore out in 6 hours.

25,680,000 PARTS PRODUCED with ONE TALIDE DIE

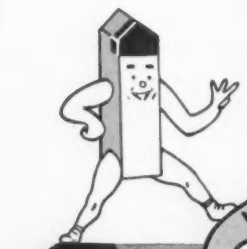
A large electrical equipment manufacturer was having difficulty maintaining production of electrical outlet boxes. Die costs were high, downtime and scrap excessive. It was necessary to remove and repolish the hi-carbon, hi-chrome die every 60,000 pieces. Total production secured from each steel die averaged 700,000 pieces.

After an initial survey, our die engineers designed and installed a **Talide** die using **Grade C-88.** Operation is performed on a 75-ton double action Bliss press. Original die was put in operation 3 years ago and is still going strong, having been removed only once for repolishing — after drawing 15,000,000 pieces!

Total production obtained to date has reached the astounding figure of 25,680,000 outlet boxes — 36 times more production than when using a steel die. The Talide die costs $1,125.00 compared to $500.00 for each steel die. Savings in die cost alone has amounted to over $18,000.00 over the past 3 years, with substantial additional savings realized in increased production. Downtime, repolishing cost and scrap expense were completely eliminated.

Call in a **Talide** sales engineer for recommendations on how to solve your particular die problem. Phenomenal runs and tremendous savings in operating costs are assured when **Talide** dies are put on the job. Our files contain hundreds of case histories on every type of application — including draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

METAL CARBIDES CORPORATION, 6001 Southern Boulevard, Youngstown 12, Ohio



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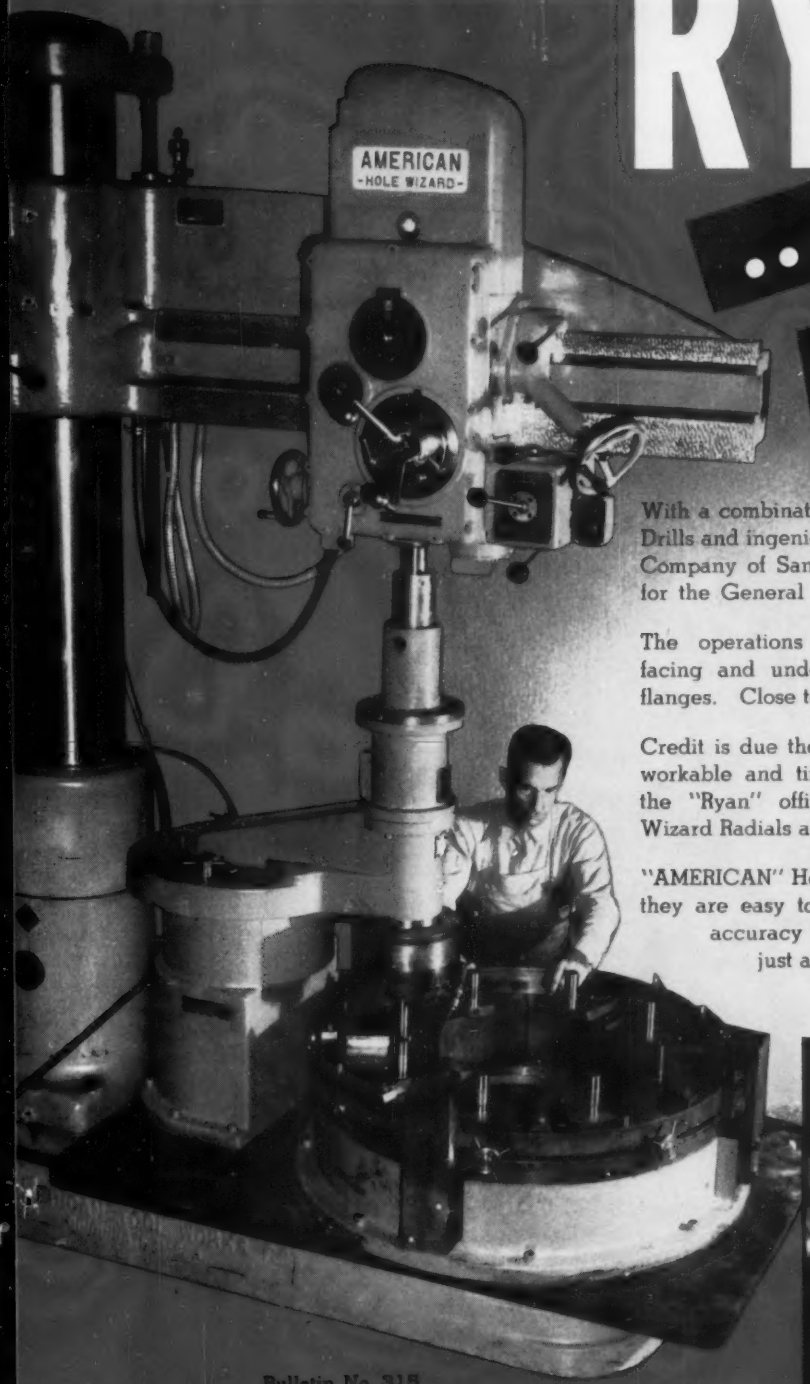
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

For more information fill in page number on Inquiry Card, on page 257

RYAN ...HITS THE JACKPOT!



With a combination of "AMERICAN" Hole Wizard Radial Drills and ingeniously designed fixtures Ryan Aeronautical Company of San Diego, California, produces Aft Frames for the General Electric J-47 jet engine in record time.

The operations performed include precision boring, facing and undercutting of the stainless steel support flanges. Close tolerances must be and *are* held.

Credit is due the "Ryan" engineers for developing such workable and time saving fixtures. Credit is also due the "Ryan" officials for selecting "AMERICAN" Hole Wizard Radials as part of the "winning combination."

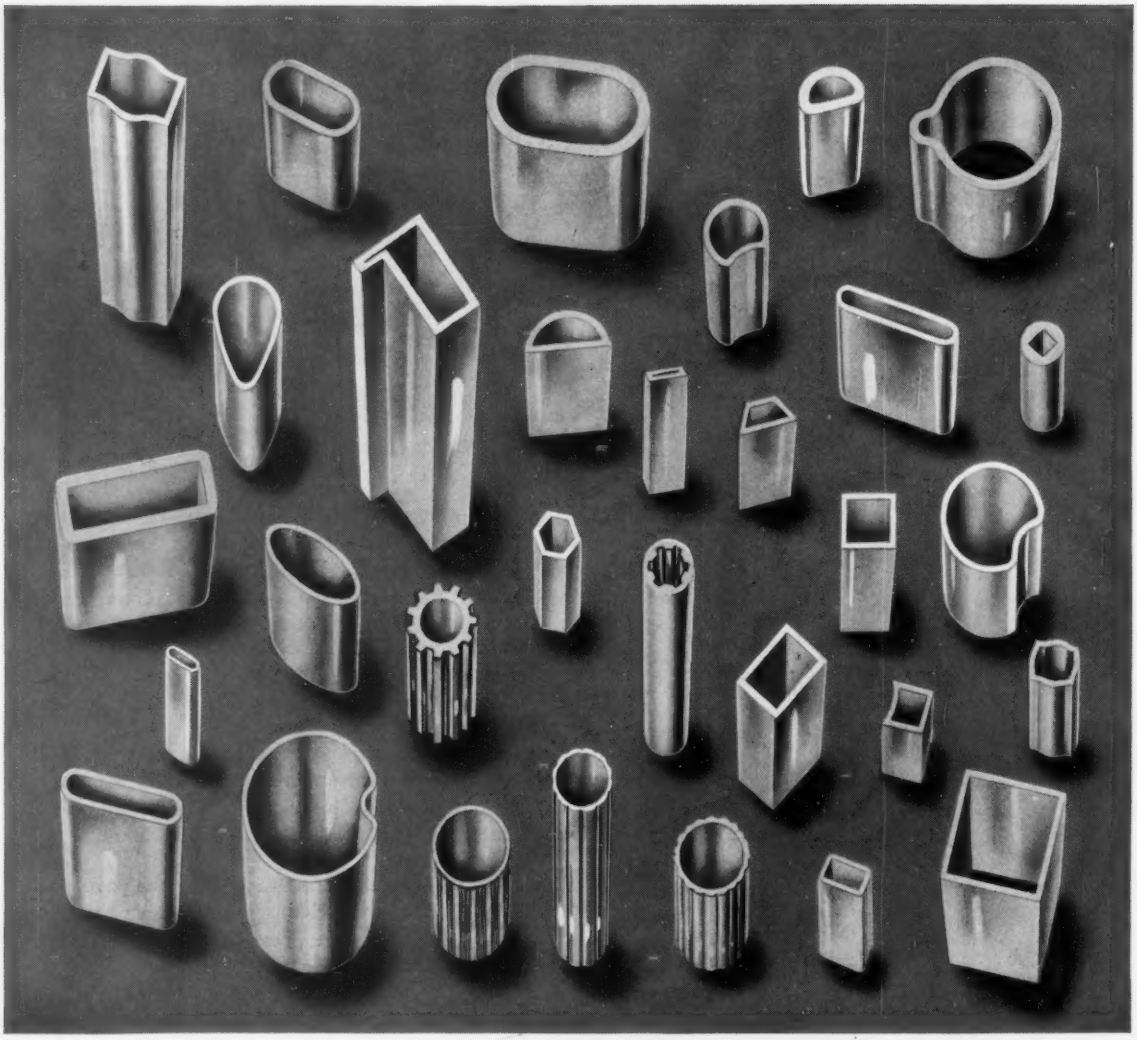
"AMERICAN" Hole Wizards are sturdy; they are powerful; they are easy to operate and they retain their original accuracy for years to come. For substantiation just ask the operator.

Bulletin No. 315
will give you the facts.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

A SHORT CUT TO A FINISHED PRODUCT



YOU NAME THE TUBE SHAPE AND THE METAL

Our specialized facilities and stock tools can save you time and money

Special-shape seamless tubes in straight lengths, or cut into short pieces, can save several steps in arriving at a finished product—can save you material and many direct labor costs. The American Brass Company's French Small Tube Division has turned out thousands of tubes in special shapes up to ¾" O.D. A variety of stock tools is available to save fitting-up charges.

For consumer products: Some special tubes are produced to the accepted commercial tolerances and finishes for such applications as electric fixtures, furniture ferrules, heat exchangers, radiator tubes, refrigeration controls, hardware, jewelry, automatic pencils, and a host of others.

High precision products: Many are made unusually accurate in I.D. and O.D. dimensions, with specially cleaned inside and outside surfaces, for parts for control instruments and for other scientific and industrial equipment.

Wide choice of metals: Special-shape tubes are available in copper, brass, bronze, nickel silver, special copper alloys, and aluminum — furnished in straight mill lengths or accurately cut to your specifications.

For action: See your American Brass Company representative or send in a sample, drawing, or description, together with the quantity you need, the metal, and other pertinent data. Address: The American Brass Company, French Small Tube Division, Waterbury 20, Conn. 8586

ANACONDA®
SPECIAL-SHAPE TUBES

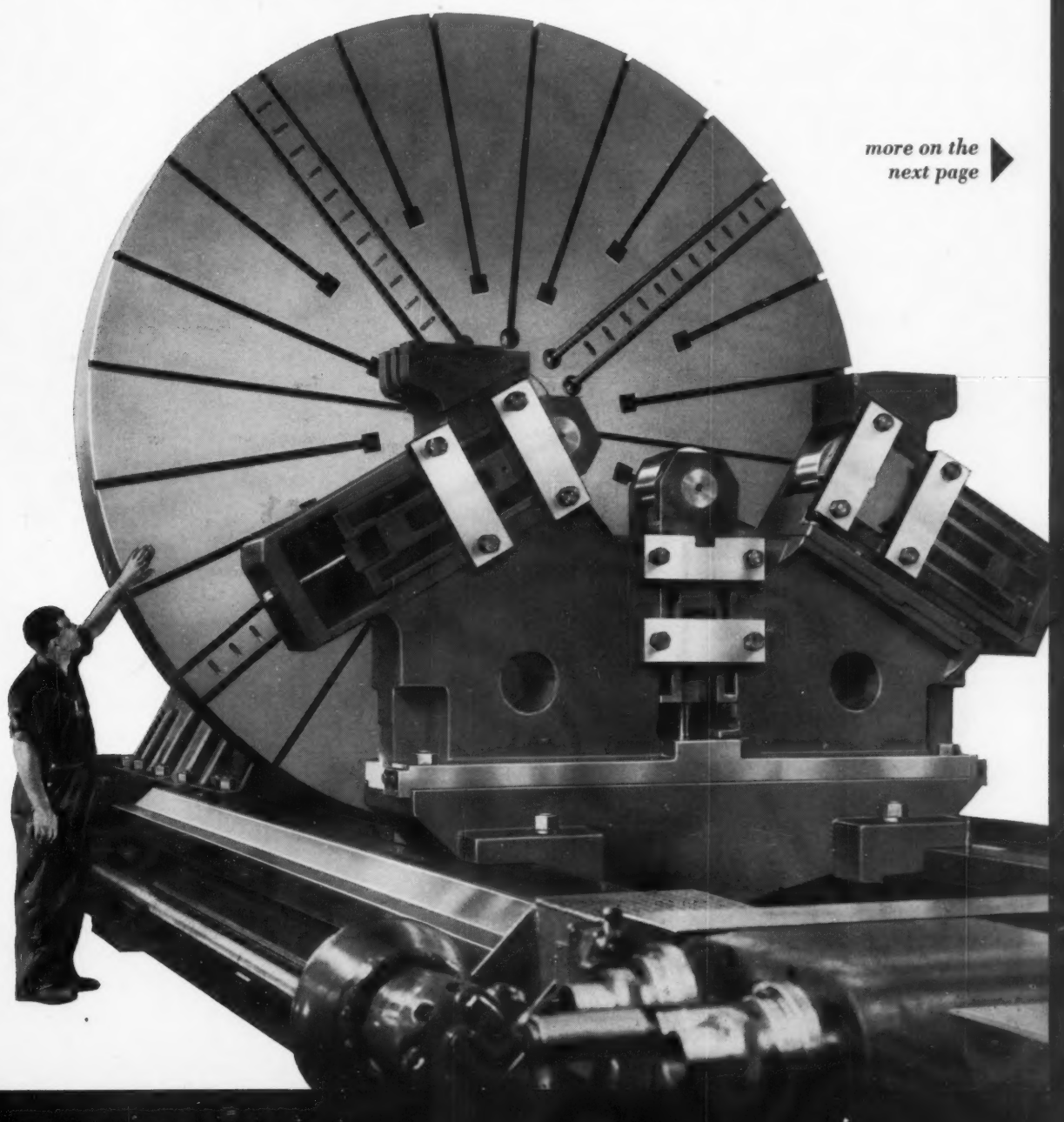
For more information fill in page number on Inquiry Card, on page 257

The man's no midget

He's 6 feet tall and the lathe is the heaviest and most powerful general purpose lathe ever built in the U. S. A.

Consolidated built it of course, and the price (if you are interested) is around a half million dollars.

more on the next page ▶



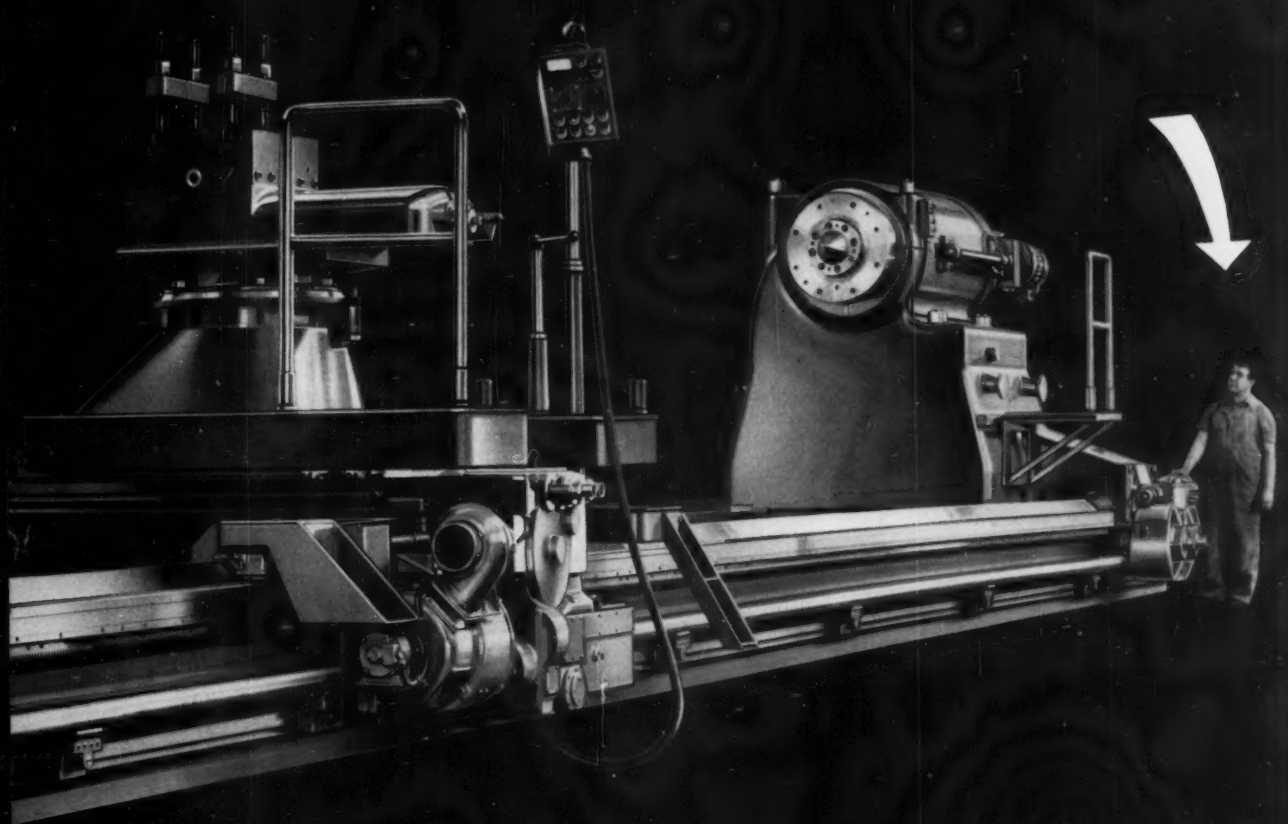
a half-
BETTS

million dollar lathe

. . . the heaviest and most powerful ever built in America!

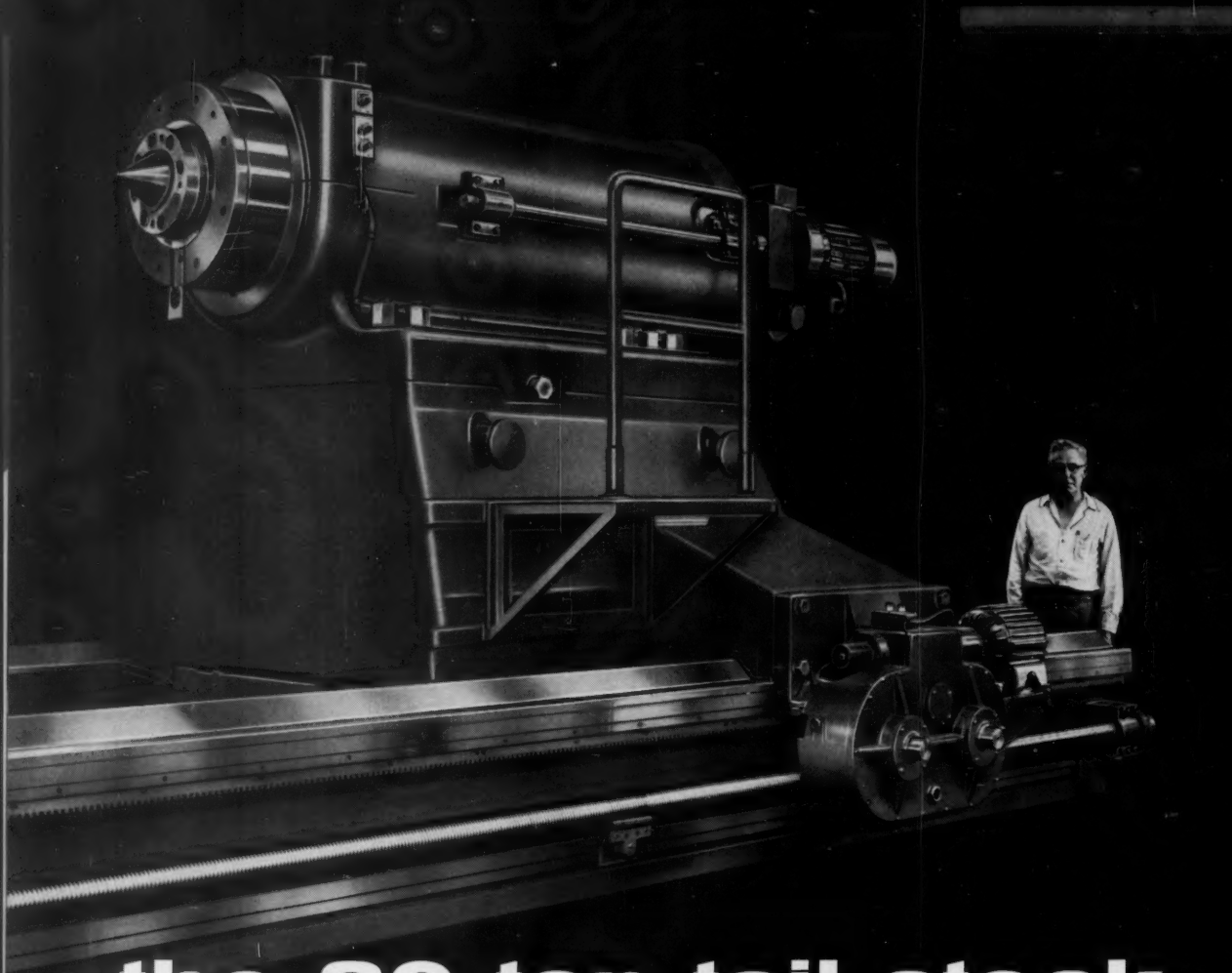
Some highlights on the new 12 foot BETTS HEAVY DUTY LATHE:

- The head and tail stock centers alone (without steady rests) will support work pieces *weighing up to 250 tons!*
- The big super-precision spherical roller type spindle bearings are 36 *inches in diameter!*
- The lathe shown (60 foot centers) weighs 245 tons.
- The front way of the bed is nearly 3 feet wide.
- The taper attachment turns tapers *up to 14 feet long* in one setting!
- The head stock is built for a 250 HP driving motor.



Advertisement | CONSOLIDATED MACHINE TOOL CO.

more on the next page



the 30 ton tail stock

Its huge live center revolves in precision roller bearings nearly two feet in diameter.

These lathes are big, but more than bigness is the quality of engineering thinking that goes into them.

For example, this big lathe is electronically controlled. The operator runs it at the cutting tools with his eyes on the cut. Infinitely variable feeds and speeds are on a portable panel at his finger tips and he can change them in fine increments *while the tools are cutting!* Power traverse is there, too. There are also such features as the adjustable spring loaded tail stock spindle that compensates for the elongation of the work piece as its temperature rises.

This is the kind of thinking that goes into Consolidated Machine Tools.

CONSOLIDATED MACHINE TOOL CO.

ROCHESTER, NEW YORK

CONSOLIDATED MACHINE TOOLS

A DIVISION OF FARREL-BIRMINGHAM CO., INC.

F/B

NEW!

Revolutionary AIRengineering Development by Ingersoll-Rand . .

TORSION BAR

Torque control

IMPACTOOLS

MULTIPLE TORQUE SETTINGS
2 TORSION BARS AVAILABLE:

- **No. L735. Max. torque 60 ft. lbs.**
- **No. H735. Max. torque 90 ft. lbs.**

Size 5040T*

***For torques up to 550 ft. lbs., a Size 5340T *Torque Control* Impactool is available**

. . . how can YOU use these
ADVANTAGES ON NUT RUNNING JOBS
where prescribed torques must be met?

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

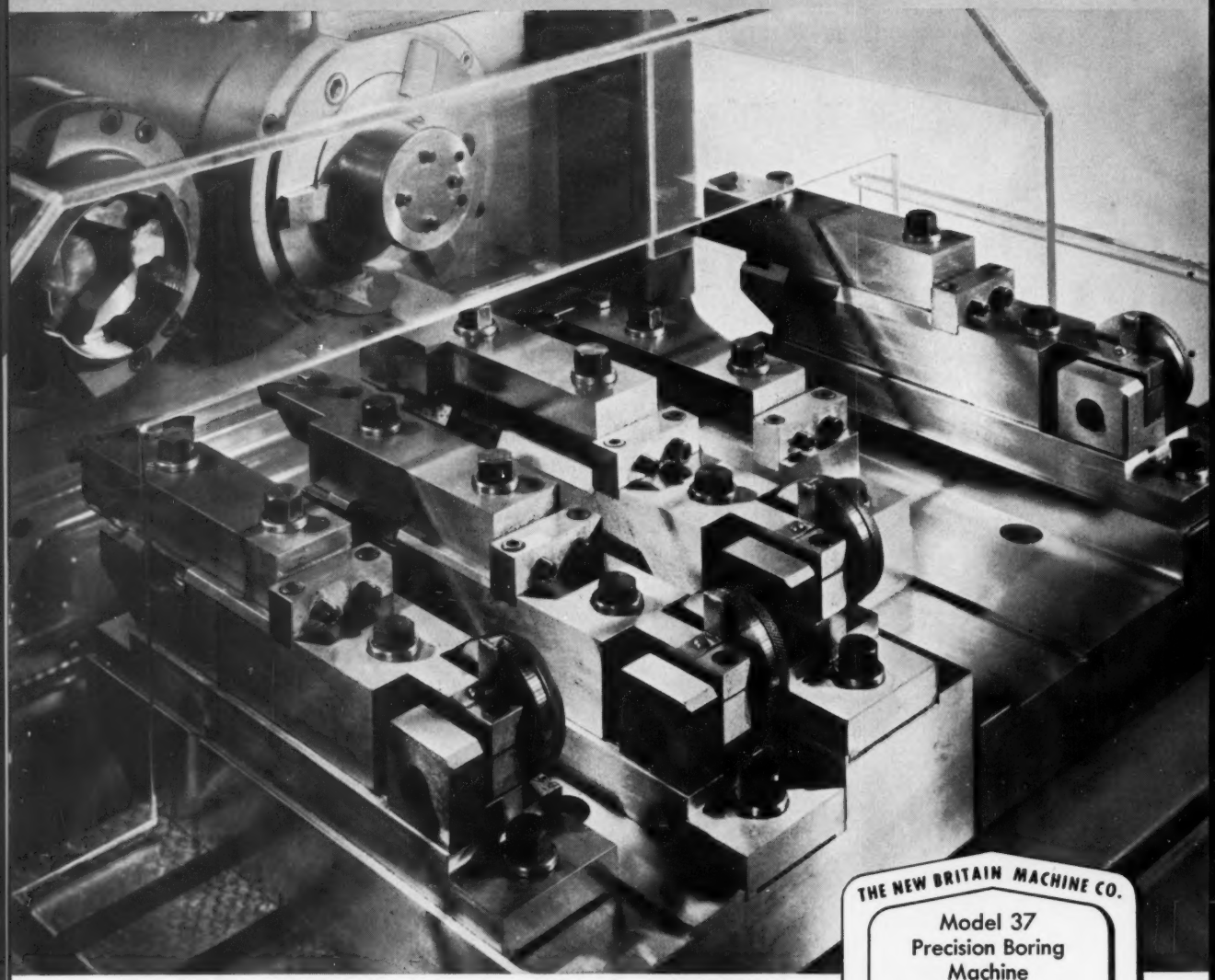
Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing develcpment.

Ingersoll-Rand

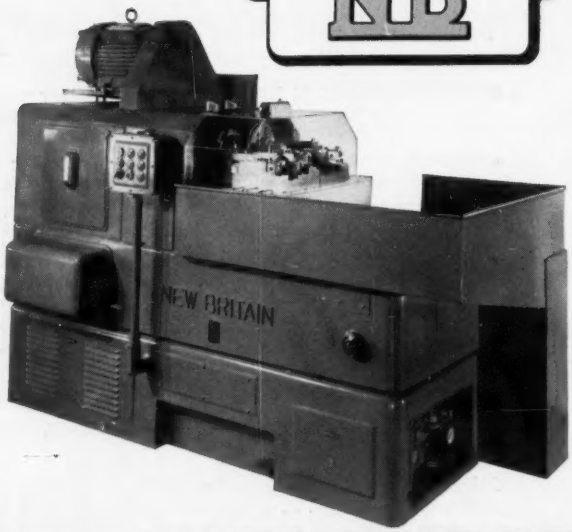
Impactool Division
11 Broadway, New York 4, N.Y.

8-305



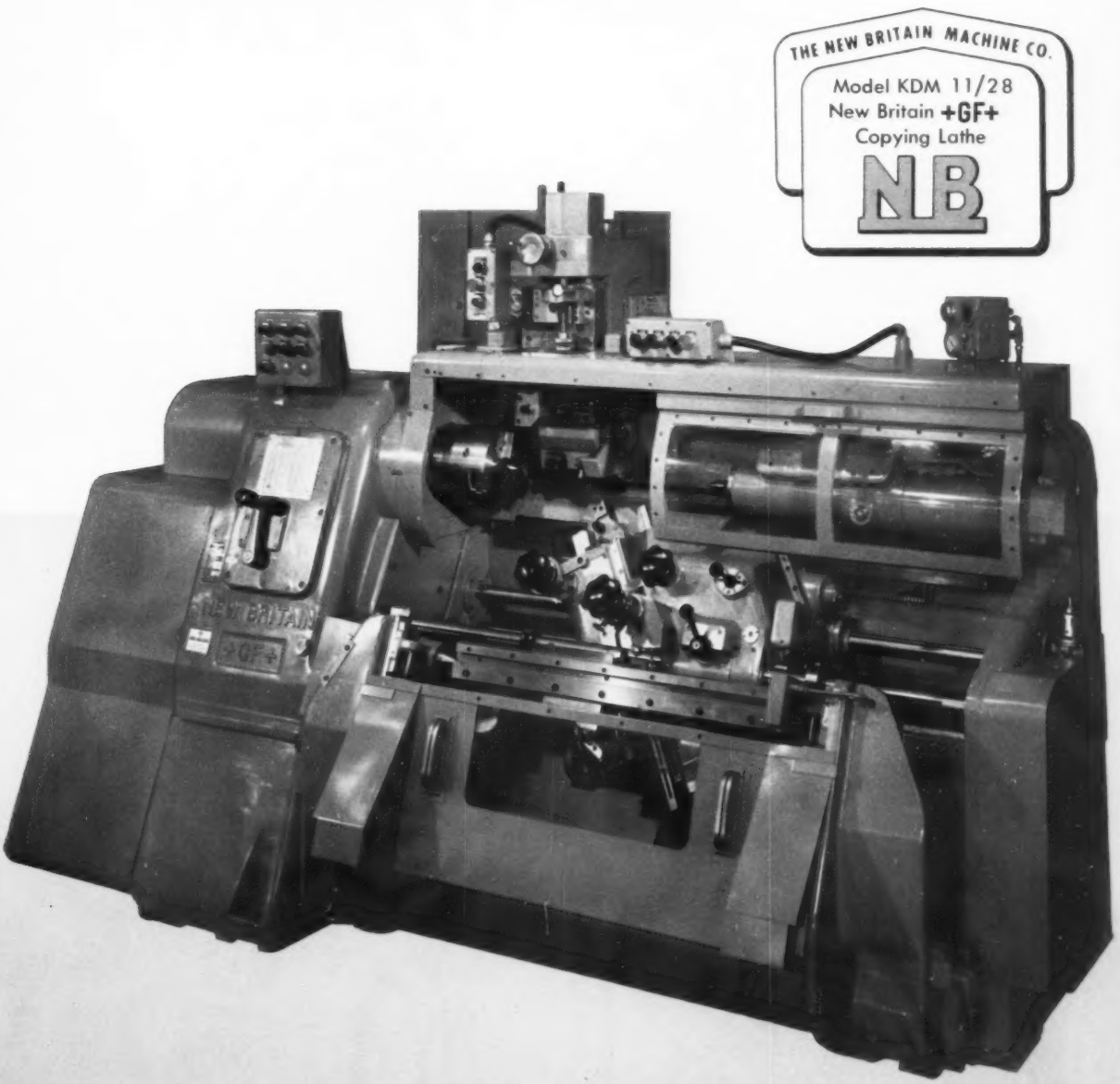
need a fresh start?

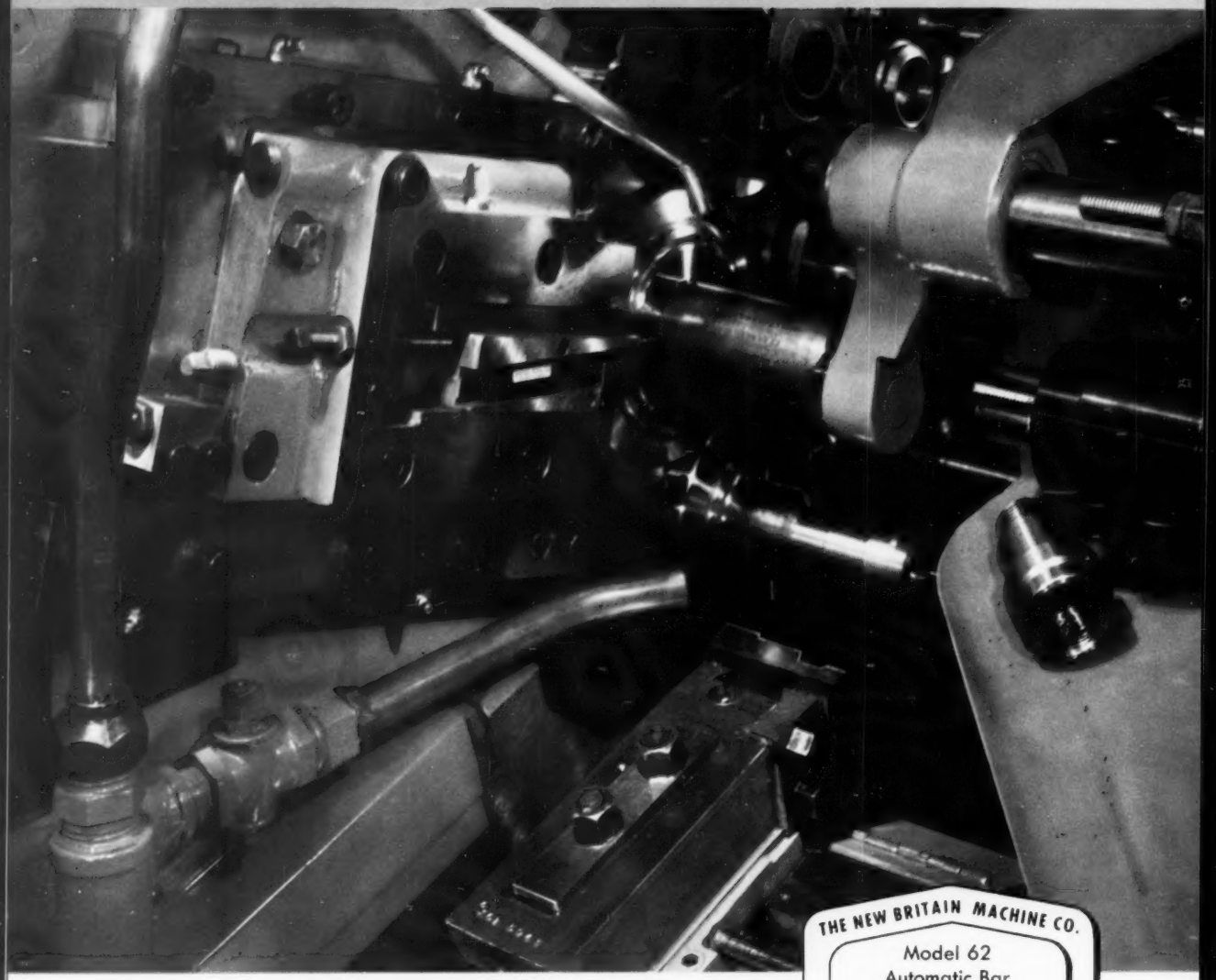
When you're stuck with "too much tooling" or costly second operations look into New Britain boring machines. New Britain's exclusive application of cam control may open up new methods, impossible on other types of machines. Low cost per piece is inherent in these New Britains, because of their versatility, high speed, high repetitive accuracy and inexpensive tooling.



everywhere you turn...

You'll find New Britain **+GF+** Copy Lathes are turning out pieces at profit. With a 15-minute setup on a standard model to make just a few pieces, or with an automatically loaded production model to run a million a year, the New Britain **+GF+** approach can make money for you. For a complete color motion picture demonstration in your office, consult your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





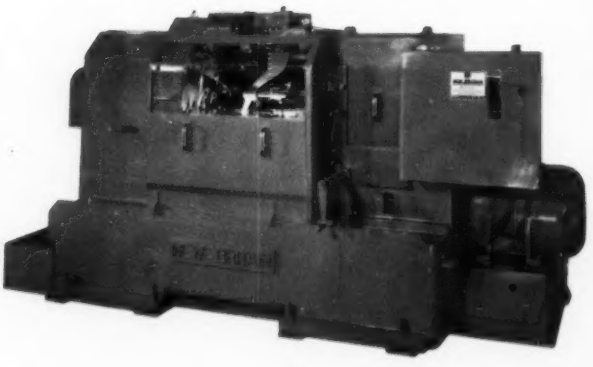
THE NEW BRITAIN MACHINE CO.

Model 62
Automatic Bar
Machine

NB

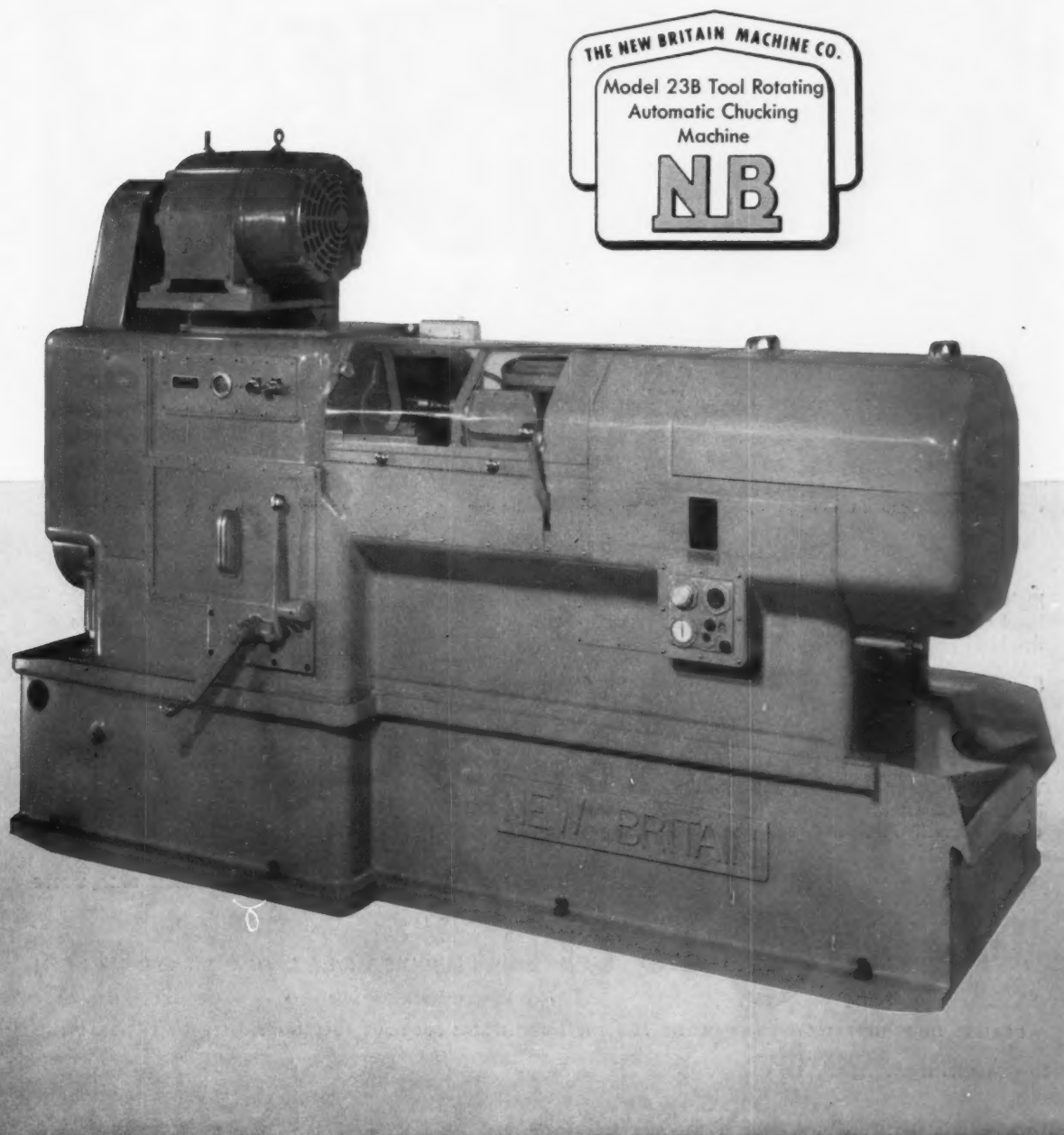
a rugged cross slide in every position

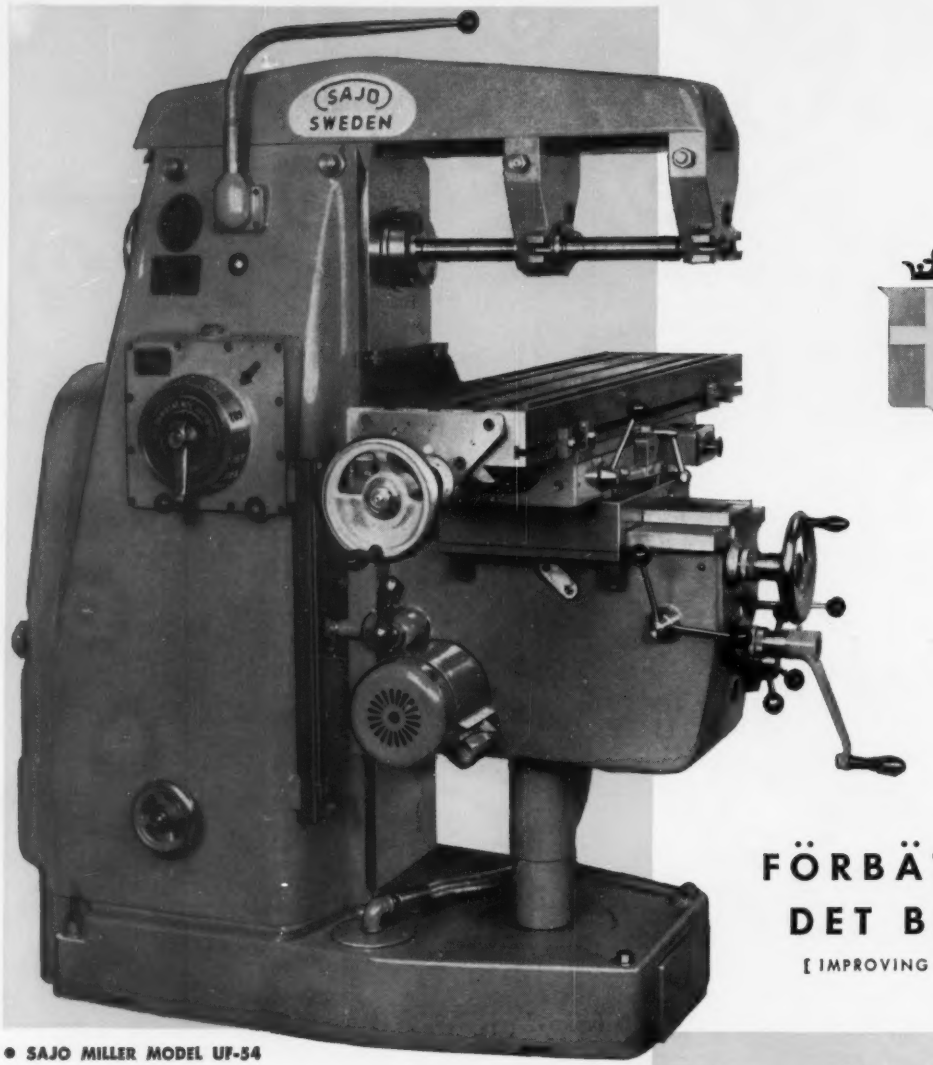
New Britain Models 60 and 61 Automatic Bar Machines are everywhere you turn. The new Model 62 represents new progress in rugged construction and versatility of setup. Your New Britain Representative can show you how to modernize at a profit. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



got a job you can't swing?

New Britain tool rotating chuckers are designed for high speed machining of irregularly shaped pieces which cannot be rotated on standard machines, and for second operation bar work. Model 23B has four spindles and five chucks, one position being reserved for loading. It indexes up to 1250 pieces per hour. For any problem involving automatic chuckers New Britain is headquarters. Consult your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





• SAJO MILLER MODEL UF-54

FÖRBÄTTRAR DET BÄSTA

[IMPROVING THE BEST]

High quality standards change only to become more exacting. The SAJO Milling Machines exemplify modern precision perfection in Swedish craftsmanship.

SAJO builds for accuracy to tenths and dependability that assures profitable production. Built to U.S. Standards, initial cost and maintenance are considerably less than comparable first quality millers.

The SAJO Model 54 is a full No. 2 capacity ALL-GEARED Miller in Plain or Universal types with handscraped sliding surfaces, and SKF Special Precision bearings on spindle and gear shafts.

POWER

7½ HP motor for spindle (5 HP optional). 1½ HP motor for table feed and 3 direction rapid traverse.

RANGE

16 spindle speeds 39-1500 RPM (31-1200 optional), No. 50NMT spindle, 12 table feeds 1¼ to 25 inches/min. longitudinal and cross, 1/32 to 12½inches/min. vertical. Power rapid traverse, all directions. Table travel 33½" long., 10" cross, 18" vertical.

CONTROLS

Single adjustable START-STOP-BRAKE lever. Dial selection of speeds and feeds (U.S. inch calibrated) with single lever controls. Magnetic motor starter.

FOR INFORMATION, CATALOGS, AND REFERENCE DATA, WRITE

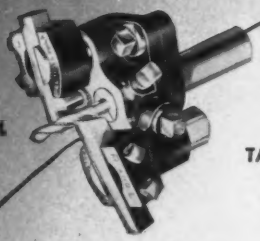
austin INDUSTRIAL CORPORATION

76-E MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

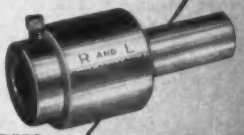
DEALERS IN PRINCIPAL CITIES • LOOK FOR THE AUSTIN SEAL . . . YOUR FULL GUARANTEE OF SATISFACTION

THE R and L LINE SAVES TIME

KNURLING TOOL



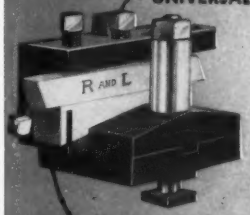
TURNING TOOL



TAP AND DIE HOLDERS

FLOATING DRILL HOLDER

RECESSING TOOL



UNIVERSAL TOOL POST

Here's how R and L TOOLS pay for themselves

These tools have been described as "tools a *particular* machinist would design for himself". Famous throughout the world for their time and labor-saving features . . . their durability . . . their quality, R and L TOOLS are truly masterpieces of the toolmaker's art.

- Speed Set-up Time
- Speed production
- Reduce rejects to absolute minimum

Write for new catalog

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS • RELEASING DIE HOLDER FOR ACORN DIES • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

R and L TOOLS
1825 Bristol Street, Philadelphia 40, Pa.

☐ Send new catalog
☐ Please have representative call.

NAME .....

COMPANY .....

ADDRESS .....

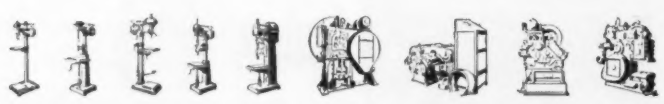
.....

M-4

For more information fill in page number on Inquiry Card, on page 257

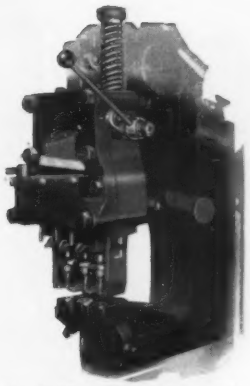
yes... YOU CAN DO ALL THESE JOBS ON A U.I.W.* — without changing

		No. 0	No. ½	No. 1½
PUNCH - - -		13/16" x 5/16"	1 13/16" x 5/8"	1 13/16" x 3/4"
		3/4" x 1/2"	1 3/16" x 3/4"	7/8" x 7/8"
Channels in Flanges		3" to 8"	6" to 12"	6" to 15"
I-Beams in Flanges		3" to 8"	6" to 12"	6" to 20"
Channels in Web		3" to 10"	5" to 15"	6" to 15"
I-Beams in Web		3" to 10"	5" to 15"	6" to 24"
In Flange, Bethlehem I-Beam		8" to 10"		
In Web, Bethlehem I-Beam		8"		
In Flange Carnegie H-Sections		4" to 5"		
In Web, Carnegie H-Sections		4" to 5"		
Beams and Channels, Flange or Web			3", 4", 5"	3", 4", 5"
SHEAR . . .				
Plates		3/8"	1/2"	5/8"
Flats		4" x 1/2"	6" x 3/8"	6" x 3/4"
Flats — with special upper knife		1 1/2" x 1/2"	2" x 3/8"	2 1/2" x 3/4"
Flats — with special upper knife		7" x 5/16"	8" x 5/16"	10" x 5/16"
Length of Knives		8"	10"	12"
Trims One Leg of Angles up to		2 1/2" x 3/8"	3" x 1/2"	4" x 5/8"
BUILT-IN 90° NOTCHER IN PUNCH HEAD . . .				
Angles		2" x 1/4"	3" x 5/16"	3" x 3/8"
Tees — Flanges		1 3/4" x 1/4"	2 1/2" x 5/16"	3" x 3/8"
Flanges of Beams		3" to 4"	4" to 6"	4" to 7"
Flanges of Channels		3"	4" to 5"	4" to 6"
Plates		1/4"	5/16"	3/8"
Depth of Cut		1 3/4"	2 3/4"	2 3/4"
BUILT-IN 90° NOTCHER ON SHEAR END . . .				
Angles		2" x 1/4"	3" x 3/8"	3" x 1/2"
Tees — Flanges		2" x 5/16"	3" x 3/8"	3" x 1/2"
Flanges of Beams		3" to 4"	3" to 6"	3" to 7"
Flanges of Channels		3"	3" to 6"	3" to 7"
Plates		1/4"	5/16"	3/8"
Depth of Cut		1 3/4"	2 3/4"	2 3/4"
BUILT-IN SQUARE COPER ON SHEAR END . . .				
Angles		3" x 1/4"	3" x 3/8"	3" x 1/2"
Tees		2" x 5/16"	3" x 3/8"	3" x 1/2"
Flanges of Beams		3" to 4"	3" to 6"	3" to 7"
Flanges of Channels		3"	3" to 6"	3" to 7"
Plates		1/4"	3/8"	1/2"
Width of Cut		2"	2"	2"
Depth of Cut		2 3/4"	3"	3"
BAR CUTTER WILL SHEAR . . .				
Rounds	With Standard Knives	1 1/4"	1 5/8"	1 7/8"
Squares	With Standard Knives	1 1/4"	1 1/2"	1 3/4"
Angles — 90°	With Standard Knives	3" x 3" x 3/8"	4" x 4" x 1/2"	5" x 5" x 1/2"
Angles — 45°	With Standard Knives	2" x 2" x 5/16"	3" x 3" x 5/16"	4" x 3" x 3/8"
Tees — Square (Given Size Only)	With Standard Knives	2 1/2" x 2 1/2" x 1/4"	3" x 3" x 3/8"	4" x 4" x 3/8"
Beams and Channels	With Special Knives	4"-7.5 lb.	5"-12.25 lb.	6"-14.75 lb.
Channels only	With Special Knives	5"-6.5 lb.	7"-12.25 lb.	8"-13.75 lb.
Angles — Square	With Special Knives	4" x 4" x 1/4"	3 1/2" x 6" x 5/16"	5" x 5" x 3/8"
Angles — Square	With Special Knives	3" x 4" x 5/16"	3 1/2" x 5" x 3/8"	4" x 6" x 3/8"
Angles — Flare	With Special Knives	4" x 5" x 5/16"	5" x 5" x 3/8"	6" x 6" x 7/16"

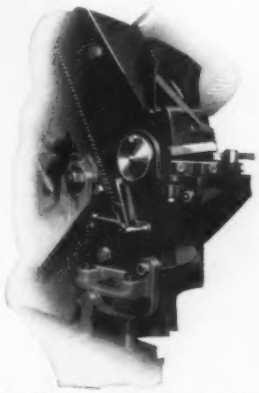


ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

DRILLING • PUNCHING • SHEARING • BENDING



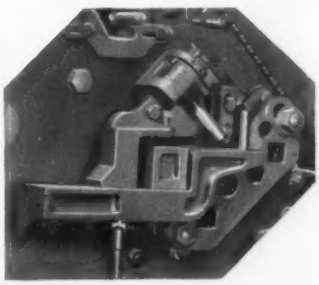
Available with triple punching attachment — also with built-in V-notcher



Built-in square coper (above) and V-notcher are exclusive with "Buffalo"

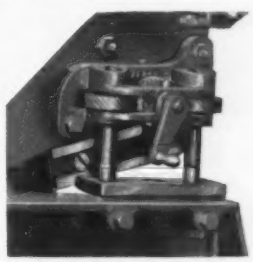
"Buffalo" *UNIVERSAL IRON WORKER

Not only can you handle all the work listed in the capacity table at left with a "Buffalo" Universal Iron Worker, but you can do it rapidly and economically. Two operators can use it at once — 3, in many cases. And the U. I. W. is built for long life with simple maintenance. Its frame is heavy, arc-welded steel plate. Throats are reinforced with rigid plug-welded separators and fillers for maximum strength where most needed. All working parts are high grade steel castings machined to close fits with-in thousandths of an inch. Internal slide surfaces have bronze faced gib adjustments to compensate for wear. And lubrication is by oil grooves to all contact areas (one-shot Bijur system available). Write today for Bulletin 360 — see the many "Q" Factor* features as well as the Structural Iron Worker for handling these same jobs in larger capacities.



Cuts angles, tees and bars. Angle miter gives 15°, 30°, 45° and 90° cuts with quick pin settings

The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.



Extra-wide shear stripper permits cutting short pieces, raises high for trimming angle legs

BUFFALO FORGE COMPANY

440 BROADWAY **BUFFALO, N. Y.**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

For more information fill in page number on Inquiry Card, on page 257

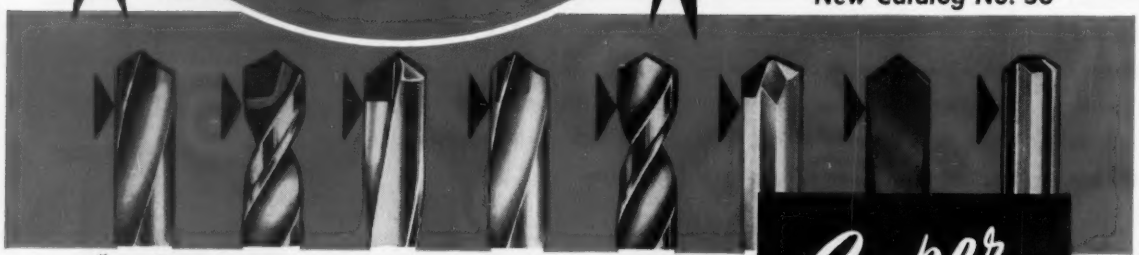
STC

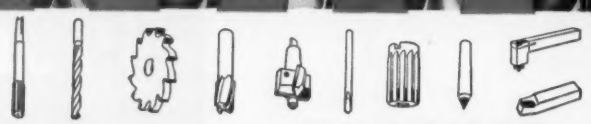
For Every Carbide Drilling Application
There's a STANDARD SUPER DRILL

NEW and really super!

Six points of superiority—Result of two years' research. Extensive tests indicate it's the most durable and the fastest cutting carbide twist drill developed to date. Feeds as high as 8" per minute in cast iron have been obtained. Stocked in fractional, wire and letter sizes for your convenience.

NEW LOW PRICES
Write to Dept. 362 for New Catalog No. 56





QUALITY CARBIDE TOOLS

Super TOOL COMPANY

21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Los Angeles 3, California

DROODLES

by ROGER PRICE

"SLIDE RULE ON A BENDER"

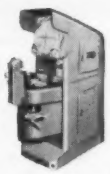
This slide rule served my Uncle George well for years, until he gave up engineering to become a full-time horse player. His frantic efforts to figure an unbeatable system made the slide rule just another sad statistic, for it fell a victim of digit-alis. George's number was up, too, because between his wife and his handicapping, he was finally nagged to death.

If *you're* being nagged . . . by difficult inspection problems . . . I can put you onto a sure thing. It's the J & L Optical Comparator, a marvelously precise inspection instrument that inspects and measures all sorts of parts and objects, in a range of sizes.

The J & L Comparator spurs production-line inspection, because it's *easy* to operate, is accurate to .0001", and is incredibly flexible and versatile. Eleven models available. Send coupon today for pay-off information.

Bench Model BC-7D

Floor Model FC-30

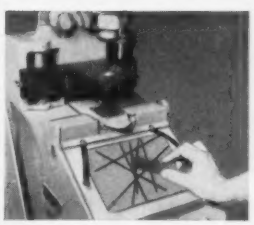


Floor Model FC-14

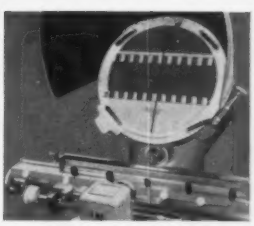
JONES & LAMSON OPTICAL COMPARATORS

Precise . . . Rapid . . . Flexible . . . Easy to operate

Checking keyway tolerances and hole diameter tolerances, as well as their locations and relationships to one another, in the same operation. Multi-base fixture allows rapid changeover for a variety of parts.



Statistical quality control of glass fibres is easy, using a vertical stage on the J & L Comparator. With 250X magnification, .001" shows as ¼" on the screen, and .0001" as .025". Each fibre is measured instantly to .0001".



Long racks or slotted bars are accurately inspected with the Adjacent Reticle Fixture. A precise scribed glass reticle provides rapid lateral indexing. Tolerance lines on the chart indicate variations in individual dimensions.

J&L. JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vermont, U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete J&L line of optical comparators.

name _____ title _____

company _____

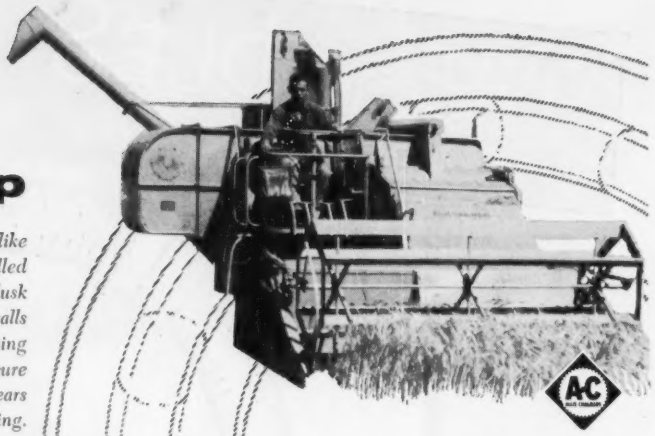
street _____

city _____ zone _____ state _____

For more information fill in page number on Inquiry Card, on page 257

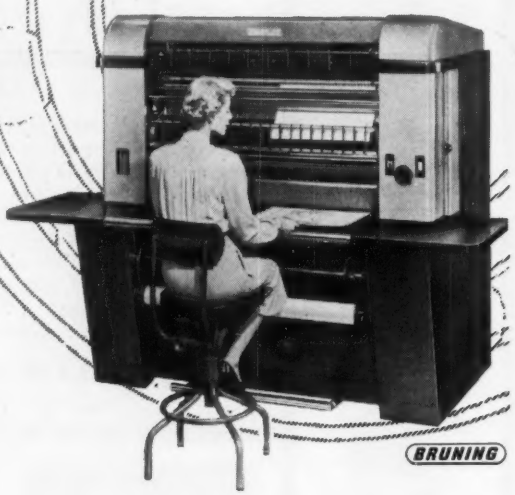
to bring in a crop

You don't baby a work-horse like this Allis-Chalmers self-propelled All-Crop Harvester. Dawn-to-dusk harvesting is rugged work—and calls for ruggedness in every rotating part. Federal Ball Bearings insure trouble-free operation and years of good harvesting.



...or run off a copy

When big plans are afoot, Charles Bruning's king-size Copyflex is on the go all day. Engineering drawings and tracings are reproduced with high precision in a continuous conveying operation. Many feed rollers are used—Federal Ball Bearings keep 'em turning.



so much of industry *turns* on FEDERAL ball bearings

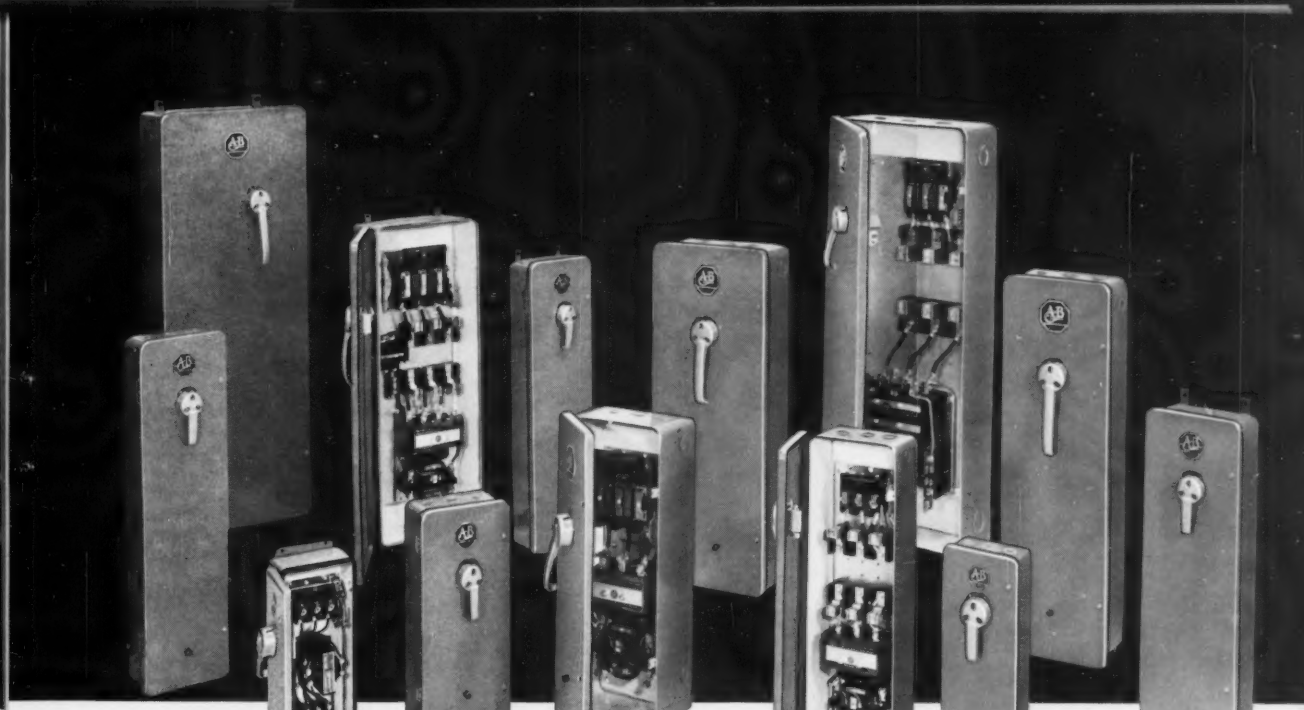
Machines that take the sweat out of harvesting... the error out of copying... the bugs out of manufacturing. Machines everywhere—in your home... your office—functioning smoothly and effortlessly, thanks to Federal Ball Bearings. 12,000 sizes to solve your anti-friction problems. Hundreds of types. Produced by a 50-year-old manufacturer of ball bearings *exclusively.*

When Federal Ball Bearings are part of so many things you *use,* shouldn't they be part of the things you *make?*

THE FEDERAL BEARINGS CO., INC. • POUGHKEEPSIE, N. Y.

New! Ball bearing and engineering data! 175 pages full in FEDERAL'S NEW CATALOG! To get your copy, just drop us a line.

Federal Ball Bearings *One of America's Largest Ball Bearing Manufacturers*

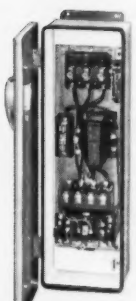


A New Line

OF BULLETIN 712 COMBINATION STARTERS

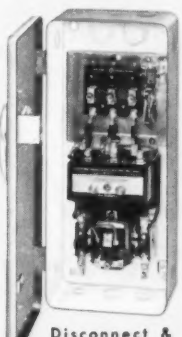
Allen-Bradley announces a modernization of its Bulletin 712 combination starters that should meet with the instant approval of plant "safety" organizations. The cover cannot be opened unless the operating lever is in the "off" position; also the movable disconnect contacts are **plainly visible** when this switch is "open." A welded or sticking contact can be detected instantly. The new operating lever contains a concealed latch pin which permits the maintenance man to open the cabinet without opening the disconnect and stopping the motor. Disconnect switch can be padlocked with three locks—in the open position. It can be arranged for padlocking in running position.

SIZE 1



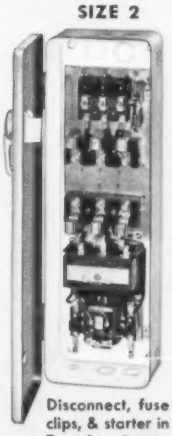
Disconnect, transformer, & starter in Type 12 cabinet.

SIZE 2



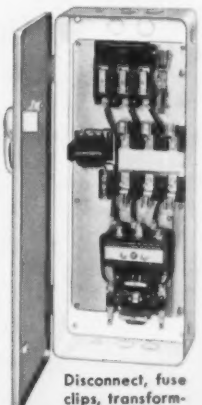
Disconnect & starter in Type 1 steel enclosure.

SIZE 2



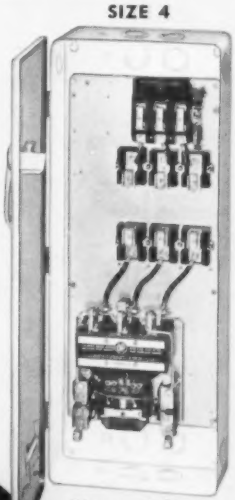
Disconnect, fuse clips, & starter in Type 1 enclosure.

SIZE 3



Disconnect, fuse clips, transformer, & starter.

SIZE 4



Disconnect, fuse clips, & starter in Type 1 enclosure.

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

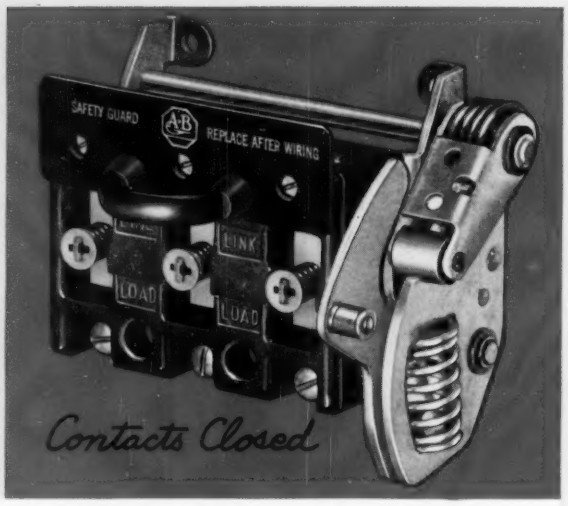
A-B Quality

ALLEN-BRADLEY

QUALITY

TROUBLE FREE MOTOR CONTROLS

4-56-MR



NEW! The first disconnect switch with movable contacts that are plainly visible in the OFF position

Allen-Bradley has finally succeeded in producing a disconnect switch, which removes all doubt whether the movable contacts are in the "open" or "closed" position. When in the "open" position, they are plainly visible—as open; when in the "closed" position, they are dropped—out of sight in the arc hood.

The moving, double break contacts of the new disconnect (shown in yellow above) move horizontally in individual arc chambers. When the disconnect is CLOSED, the moving contacts are DOWN in the arc chambers. In the OPEN position the moving contacts are UP in plain view, as shown in the colored illustration directly above.

If a contact should stick or weld, it will fail to rise to its "open" position and thereby indicate that the respective "link" remains closed—a plainly visible warning signal to the maintenance man.

Bulletin 712 Form 2F Size 1 combination starter with visible contact disconnect.

A unique feature of the new line are the interlocks built into the disconnect lever.

First—the disconnect lever is interlocked with the door latch so that the door cannot be opened unless the lever is in the OFF position. This assures that the starter is "dead" when the cabinet is open and is safe to inspect.

Second—the disconnect lever has a concealed release pin used only by authorized persons for opening the cabinet door, if needed, without shutting down the motor.

Standard operating lever permits use of one to three padlocks to lock in "off" position, but also can very simply be changed to permit padlocking in "on" position.

These new Bulletin 712 combination starters are available in NEMA Type 1, 4, 7, 9, and 12 enclosures. They are listed from 1 to 100 hp, 220 v; 200 hp, 440-550 v.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

QUALITY

4-56-MR

New Balanced Mobil D.T.E. Oils—

Socony Mobil D.T.E. Oils have long set the standard for performance of hydraulic and circulating oils. Today, after many years of continuing laboratory research and several years of exhaustive field tests, we announce a completely new line of Mobil D.T.E. Oils. These are balanced to give much greater resistance to deposits, longer life even at high temperatures, superior wear protection and rust prevention.

These new oils will meet the over-all requirements of your hydraulic and circulating systems *better than any other product.*

★ ★ ★

For further information on how new D.T.E. Oils can improve your production and cut costs, fill out the form below.

SOCONY MOBIL
CORRECT LUBRICATION

First Step in Cutting Costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

* I would like to know more about your new balanced D.T.E. Oils

Name _____

Company _____

Street _____ Zone _____ State _____

City _____

SEND TO: Socony Mobil Oil Company, Inc.
Room 1316, 26 Broadway
New York 4, New York

"Competitive wheels have never equalled G Bond wheels on our jobs." This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, besides being extremely free cutting, requiring very little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001". The machine is a Norton 10" Hydraulic Surface Grinder.

Better surface grinding for you... G BOND users' reports prove it!

Top speed, new economy among many "TOUCH of GOLD" *advantages listed*

Reports from surface grinding customers on the performance of G Bond wheels sound pretty much alike. That's logical, because each customer is getting exactly the advantages he's looking for — *freer, cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing...more work, and more kinds of work, per wheel.*

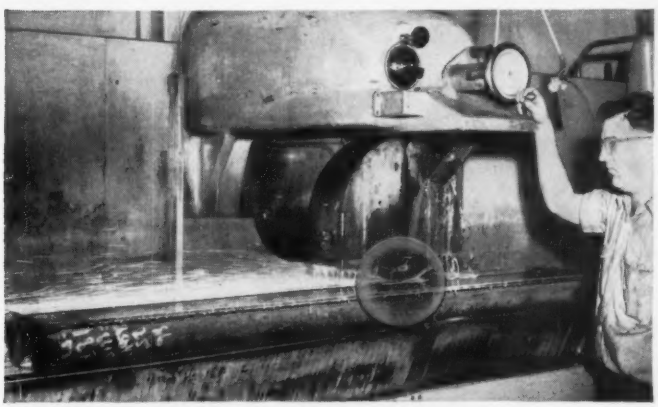
Your Own Surface Grinding

will benefit by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage that means time and money saved, plus better product quality, throughout the range of precision and semi-precision grinding jobs.

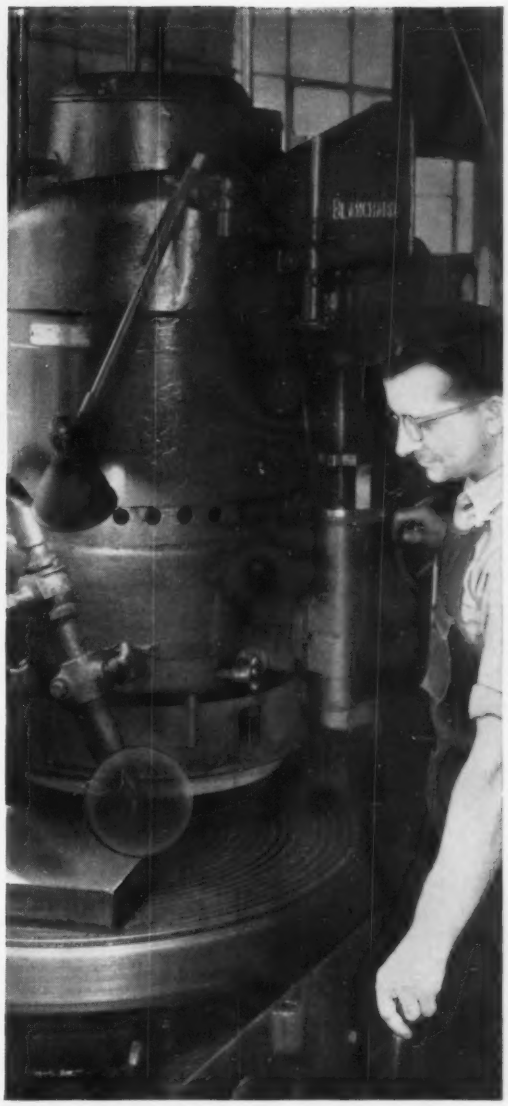
See Your Norton Distributor

for the G Bond wheels, cylinders and segments you need. They're available in a variety of famous Norton abrasives. Of these, 32 ALUNDUM* abrasive is particularly suited for fast stock removal and heavy feeds — it grinds exceptionally cool and fast, with minimum dressing. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Grinding precision spur gears of SAE 8620 steel, hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.



"Norton G Bond wheels are faster and freer cutting, need less dressing than any other wheels we've used," says this Pennsylvania metal working company. Material ground is boiler plate and miscellaneous steel plate. Stock removal rate is 4.5 to 6 cubic inches per minute.



Jigs, fixtures and other parts of miscellaneous steels, besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.

W-1644

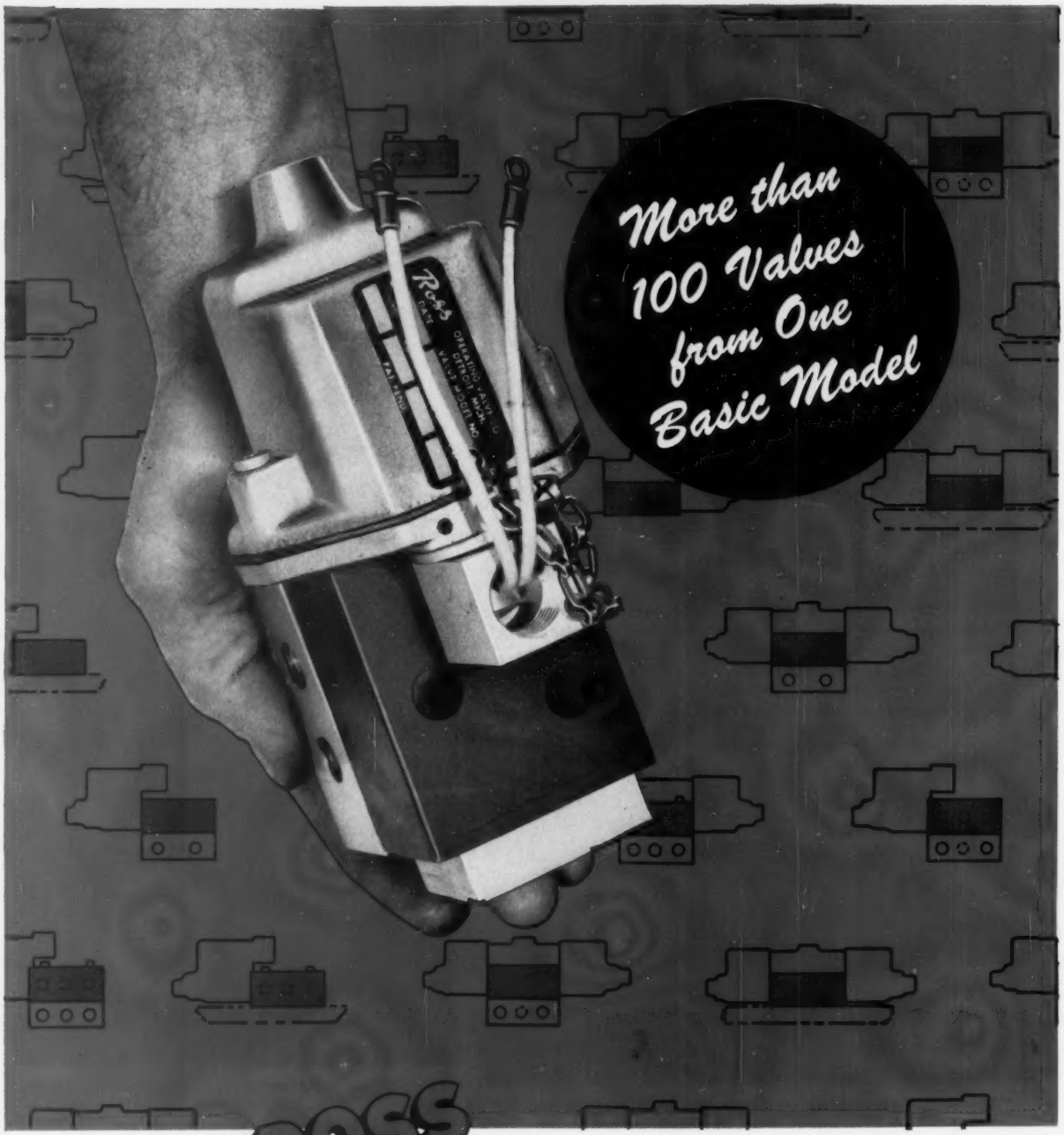
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Making better products... to make your products better

and its **BEHR-MANNING** *division*

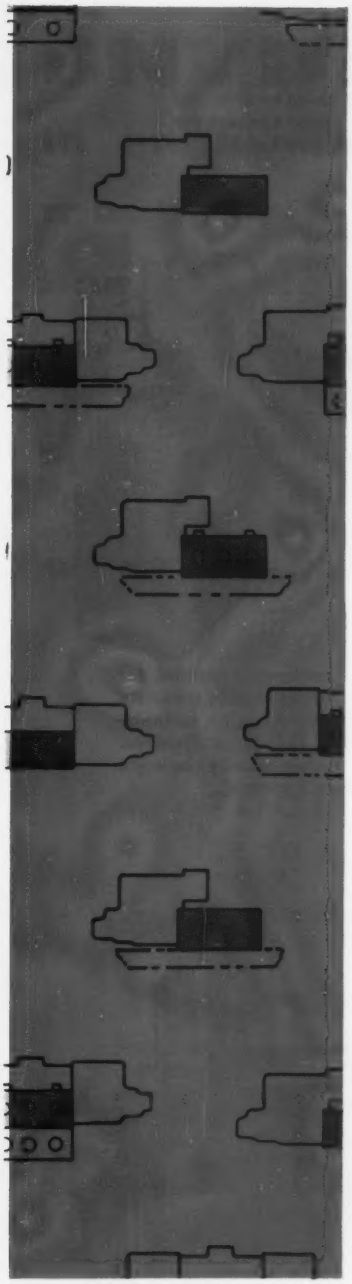
NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



ROSS
Control
VALVES

The Bridle for Air Horsepower

Ross



Introducing the

COMET II

An Advanced Conception of Valving by Ross!

Direct Solenoid Operated, Balanced Spool 4-Way for Air or Oil Service

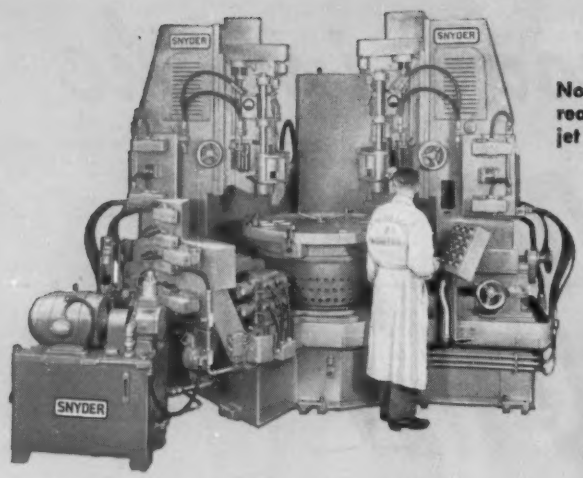
- Engineered and built to tolerances of .0001".
- Conforms to JIC standards.
- Complete valve cycle within 0.033 sec.
- Made of aluminum—single solenoid, base mounted weighs only 3½ lbs.
- Working surfaces almost as hard as a diamond.
- Small and compact—7¼" by 3½" by 3⅞". ¼" diameter flow capacity.
- Available with ¼" or ⅜" pipe tap for inline, manifold or base mounted; single solenoid spring return, double solenoid momentary; double solenoid three position.

Write, wire or phone for complete information

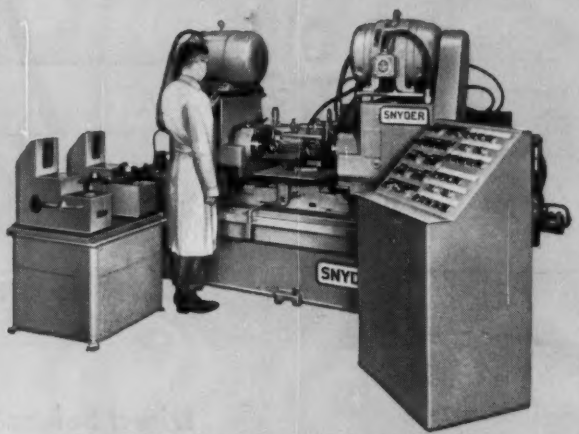
Tomorrow's EnginAIRing Delivered Today . . . Anywhere

OPERATING VALVE COMPANY

110 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

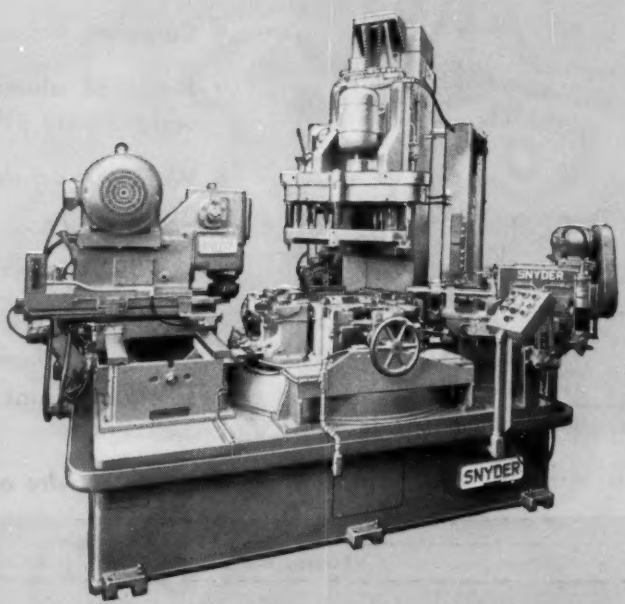


No. 70165—Special index machine to drill and ream holes in rims of outer shroud spacers for jet engines. Production 2 parts per hour.

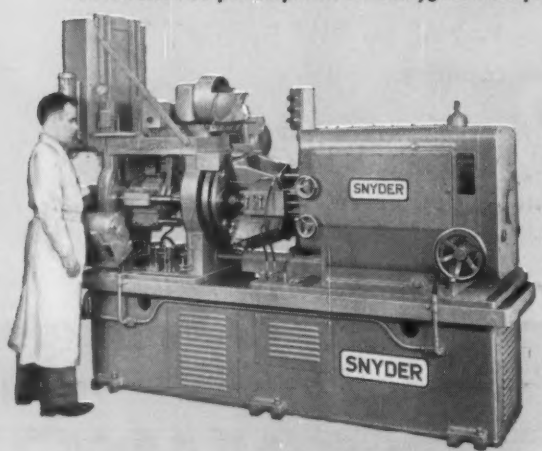


No. 65412—Special automatic machine, for weighing and precision balancing a variety of heavy-duty and diesel engine connecting rods from 7⅜" to 12" center distance. Weighs rods and automatically balance mills to plus or minus 2 grams.

No. 207390—Special, double-end precision boring machine for finish boring, counterboring and chamfering counter shaft, intermediate and shifter shaft holes on power take-off cases. Production 82 pieces per hour at 80% efficiency.



No. 73902—Special 4-station automatic index machine for milling joint face, drilling and reaming vertical and horizontal holes in exhaust manifolds. Production 80 pieces per hour at 80% efficiency.



No. 68526—Special double end trunnion machine, fully automatic, for machining special aircraft rivets. Machine is automatically loaded and unloaded. Production rate varies with size of rivet.

SNYDER VERSATILITY

in engineering and building metal-cutting machines includes not only the great Snyder line transfer machines with automation, but also many smaller and diversified machines in which the standards of performance and economy are no less exacting. A few representative examples are shown.

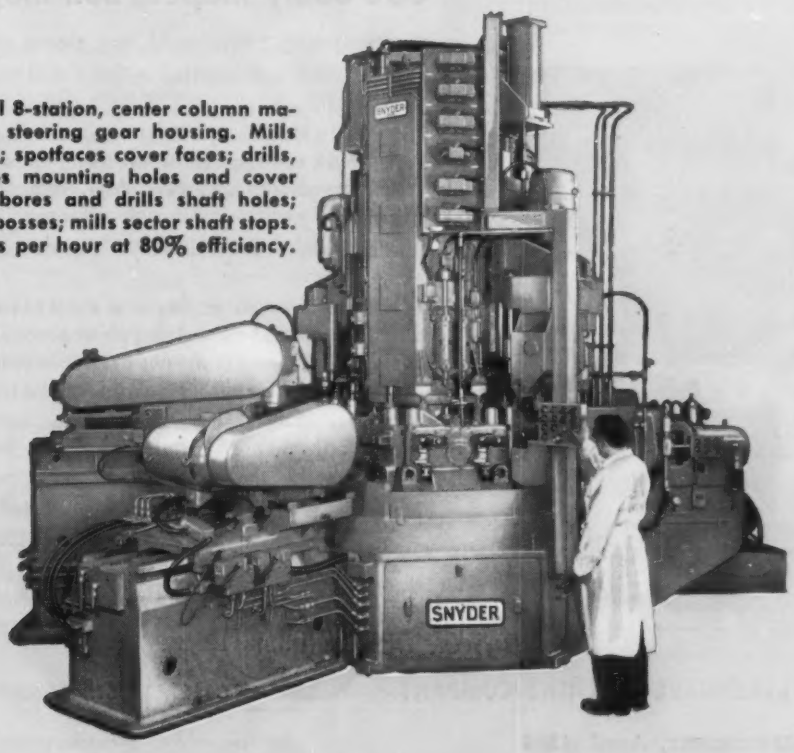
SNYDER

TOOL & ENGINEERING COMPANY

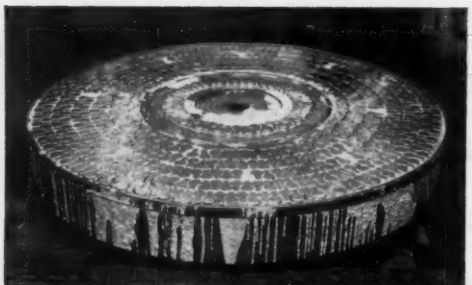
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

31 Years of Special Machine Tools with Automation

No. 72976½—Special 8-station, center column machine for processing steering gear housing. Mills pads and cover faces; spotfaces cover faces; drills, countersinks and taps mounting holes and cover holes; rough counterbores and drills shaft holes; mills two Welch plug bosses; mills sector shaft stops. Production 260 pieces per hour at 80% efficiency.

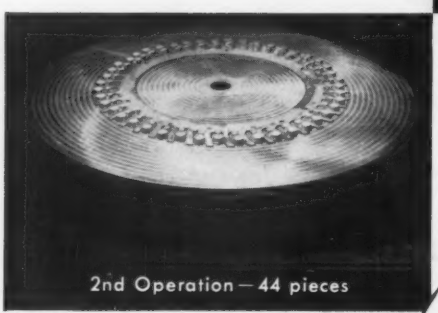


Another example



1st Operation—653 pieces

W-1138



2nd Operation—44 pieces

W-1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

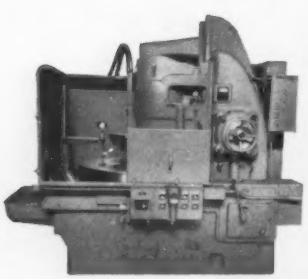
Blanchard Surface Grinders are noted for their unusual versatility—like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours—including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of =.003. Each load takes eight minutes—floor-to-floor.

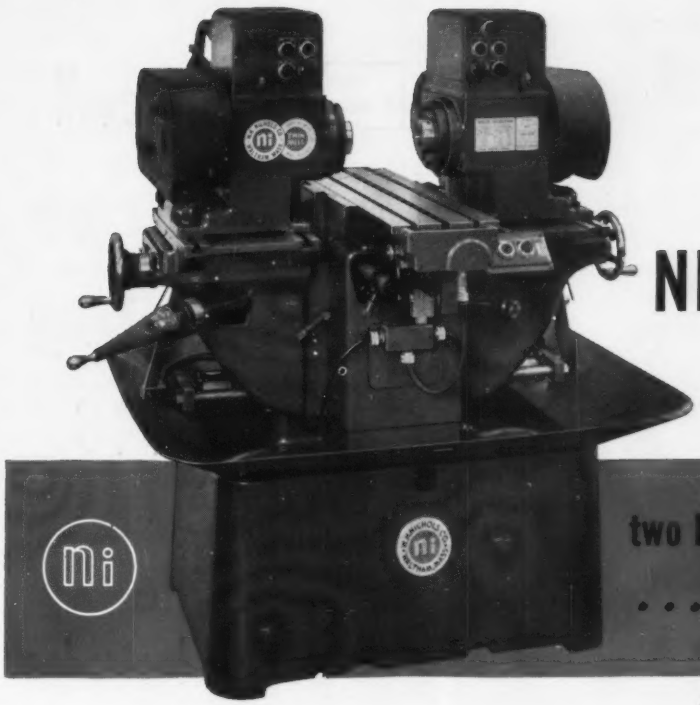
As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard—whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition—recently revised.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.



NICHOLS TWIN MILL

two heads are better than one ....for sure!

The Nichols Twin Mill is something new in duplex millers — a precision 2-spindle bed-type miller designed for simultaneous light duty milling of opposite or adjacent surfaces, using **horizontal or vertical spindles.**

The Twin Mill provides unmatched flexibility! It is equally adaptable for long-run or short-run jobs. The two geared milling heads are independent units, with separate 1 HP motor drives, and are quickly adjusted either directly opposed or offset longitudinally, vertically or transversely. Set-up is fast and simple.

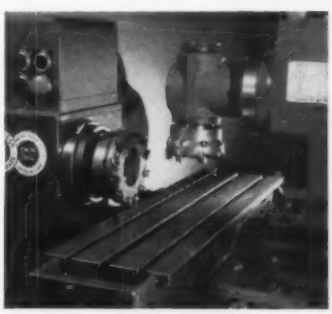
The wide range of spindle speeds from 55 to 2050 R.P.M. allows milling of ferrous or non-ferrous materials with high speed or carbide tipped cutters, producing EXTRA FINE FINISH while maintaining the closest tolerances with ease.

The Twin Mill is completely push-button controlled, arranged for automatic table cycling—with rapid approach, hydraulically controlled variable cutting feed and rapid return. Available with automatic retraction of milling heads, automatic spindle brakes and carefully engineered special features to meet specific applications.

The parts shown are typical of those on which the Twin Mill is cutting costs and boosting production. Investigate the savings it can make for you. For details write to Nichols-Morris Corporation.

CONDENSED SPECIFICATIONS

Table, working surface	8⅝" x 30"
Table Travel—cutting stroke	11¾"
Motors	(two) 1 HP
Spindle Speeds (15)	from 55 to 2050 RPM
Max. height center of spindle above table	11¾"
Max. offset of spindles (horizontal)	8½"
Max. distance between spindle noses (across table)	16"
Floor space required	64" x 56"



Manufactured by W. H. Nichols Company, 48 Woerd Avenue, Waltham 54, Mass.

76-E Mamaroneck Ave. NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION White Plains, New York

For more information fill in page number on Inquiry Card, on page 257

Electrical Discharge Machining

saved $448 sinking this forging die using BRASS electrodes

Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
TOTAL	108 hours

ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
TOTAL	44 hours

Saved: 64 hours at $7 per hour

additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

*T.M. Reg.

elox

corporation of michigan

1833 Stevenson Hwy.
Royal Oak 3, Mich.

Elox Electron Drills for removing broken taps, drills, etc., from $495 to $3450.

DEMONSTRATION CENTERS

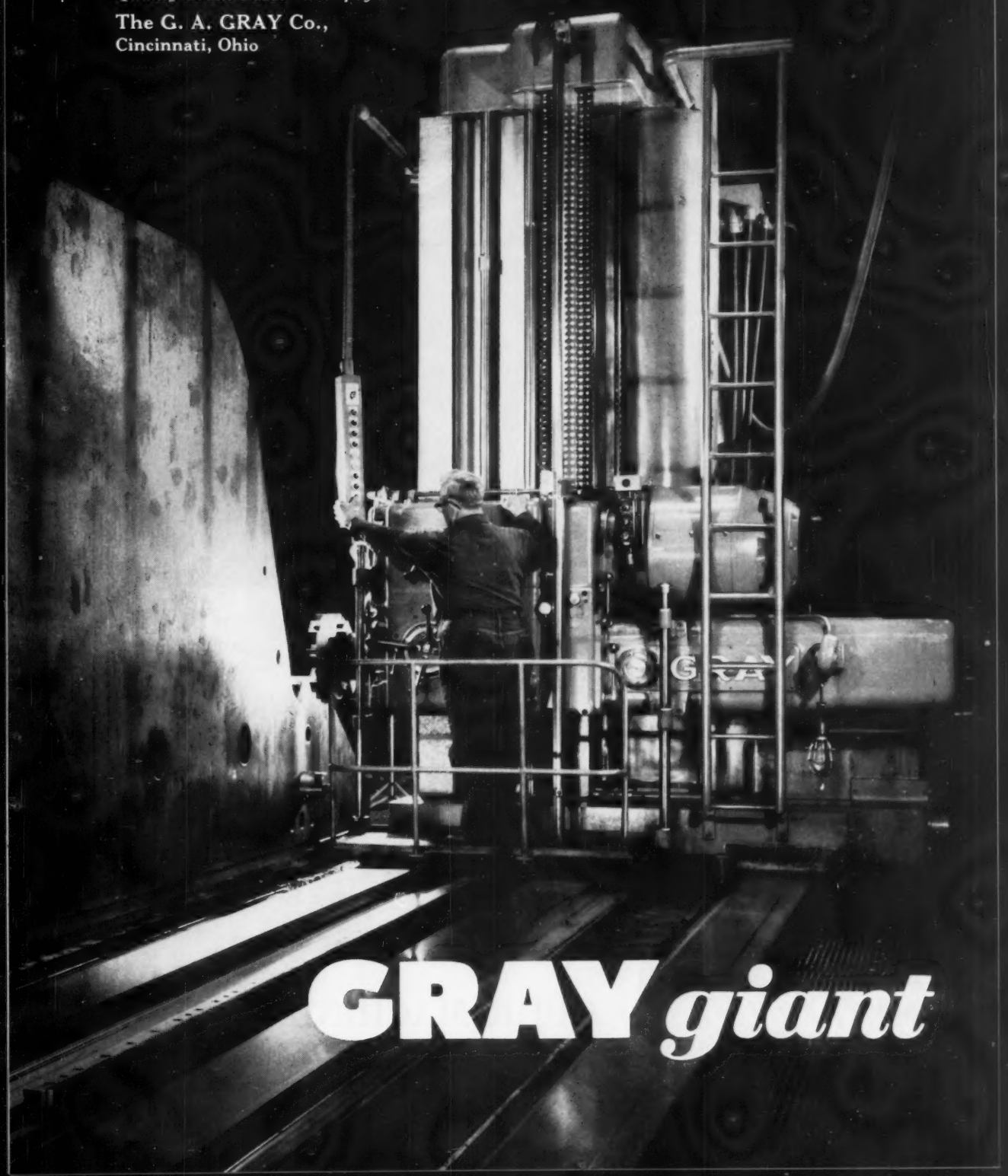
Plant—Royal Oak, Mich.
45 Broad Ave., Palisades Park, N.J.
1907 W. Monterey, Chicago, Ill.

For more information fill in page number on Inquiry Card, on page 257

The new GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances. You'll find a rapidly increasing number of these cost-cutting giants in modern shops throughout the world.

GRAY'S high precision, ease of operation, and modern power, will do your jobs better and faster, further proof that *Quality doesn't cost . . . it pays.*

The G. A. GRAY Co.,
Cincinnati, Ohio



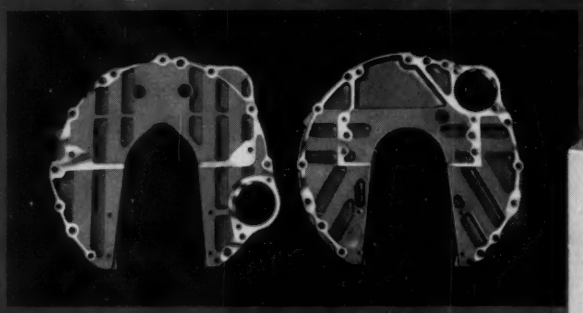
GRAY *giant*

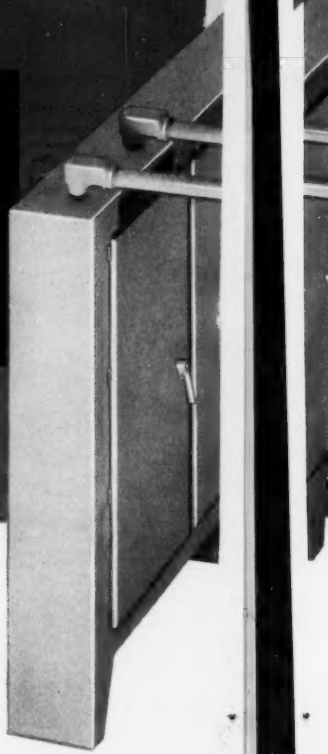
Buhr ECONOMATIC

performs 155 operations on two types of torque-converter adapter plates!

Production . . . 200 pieces per hour at 100% efficiency

Operations . . .
37 drilling, 12 reaming,
4 boring, 37 countersinking,
36 inspection
and 29 tapping





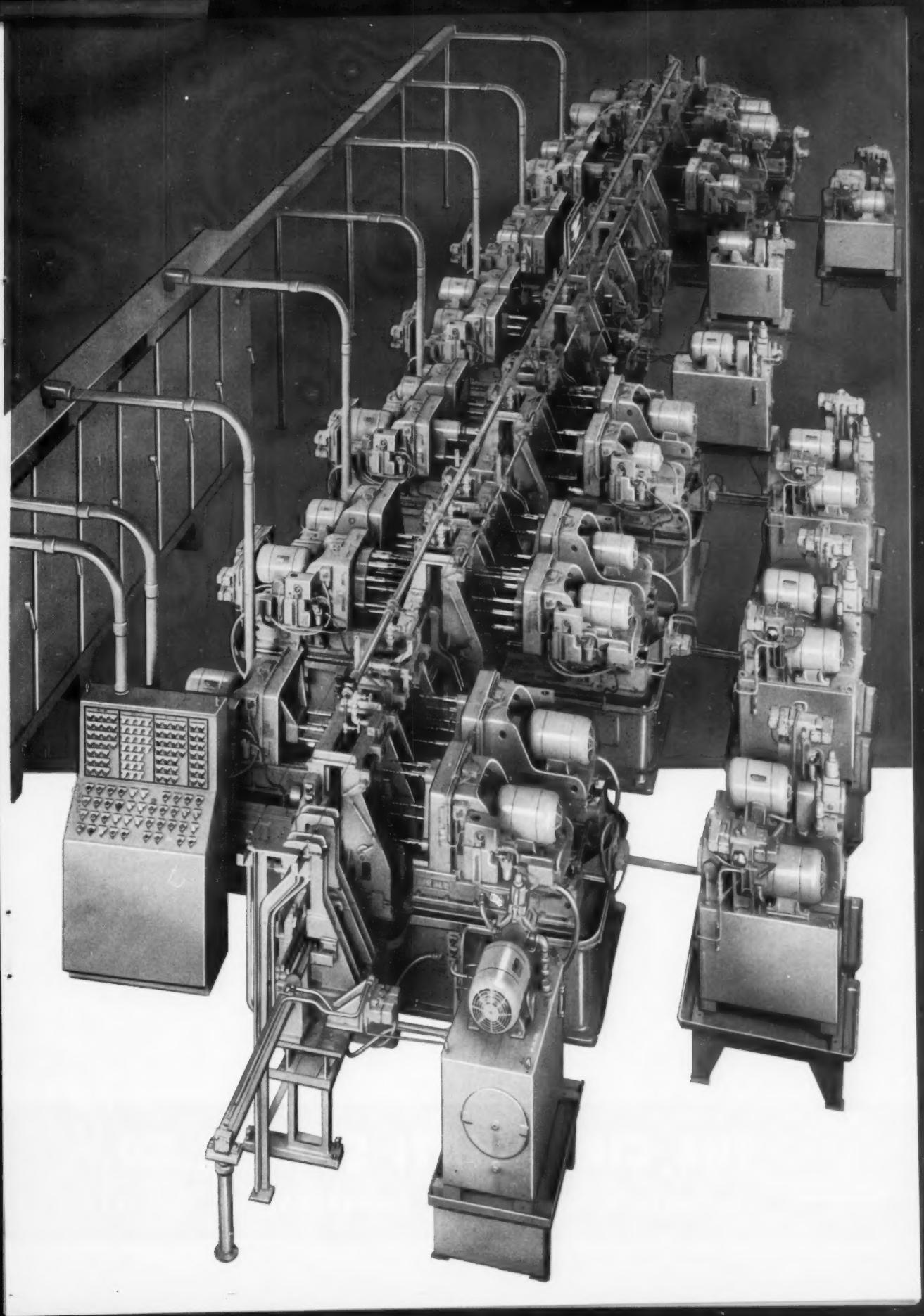
- Two types of plates may be loaded at random. Machine automatically selects and performs required operations
- Sectionalized bases to facilitate future part changes
- Automatic lubrication of all moving parts
- Mist-lubrication to all spindles to maintain uniform temperature in heads
- All spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- All standard and special parts interchangeable for ease of maintenance
- Machine conforms to J.I.C. Standards

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

BUHR MACHINE TOOL CO.©

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers



This CINCINNATI...

1½" thick x 12'

This 15012 Series Cincinnati All-Steel Shear has a 36" gap and a 48" back gauge range.

Power for heavy cutting with accuracy and operating convenience are combined in this machine.

Modern features such as—Hydraulic Holddowns, Front Operated Power Back Gauge, Hinged Back Gauge Angle, Automatic Pressure Lubrication, All-Steel Interlocked Construction, Forged Alloy Steel Eccentric Shaft—all contribute to an outstanding performance with low maintenance and high accuracy.

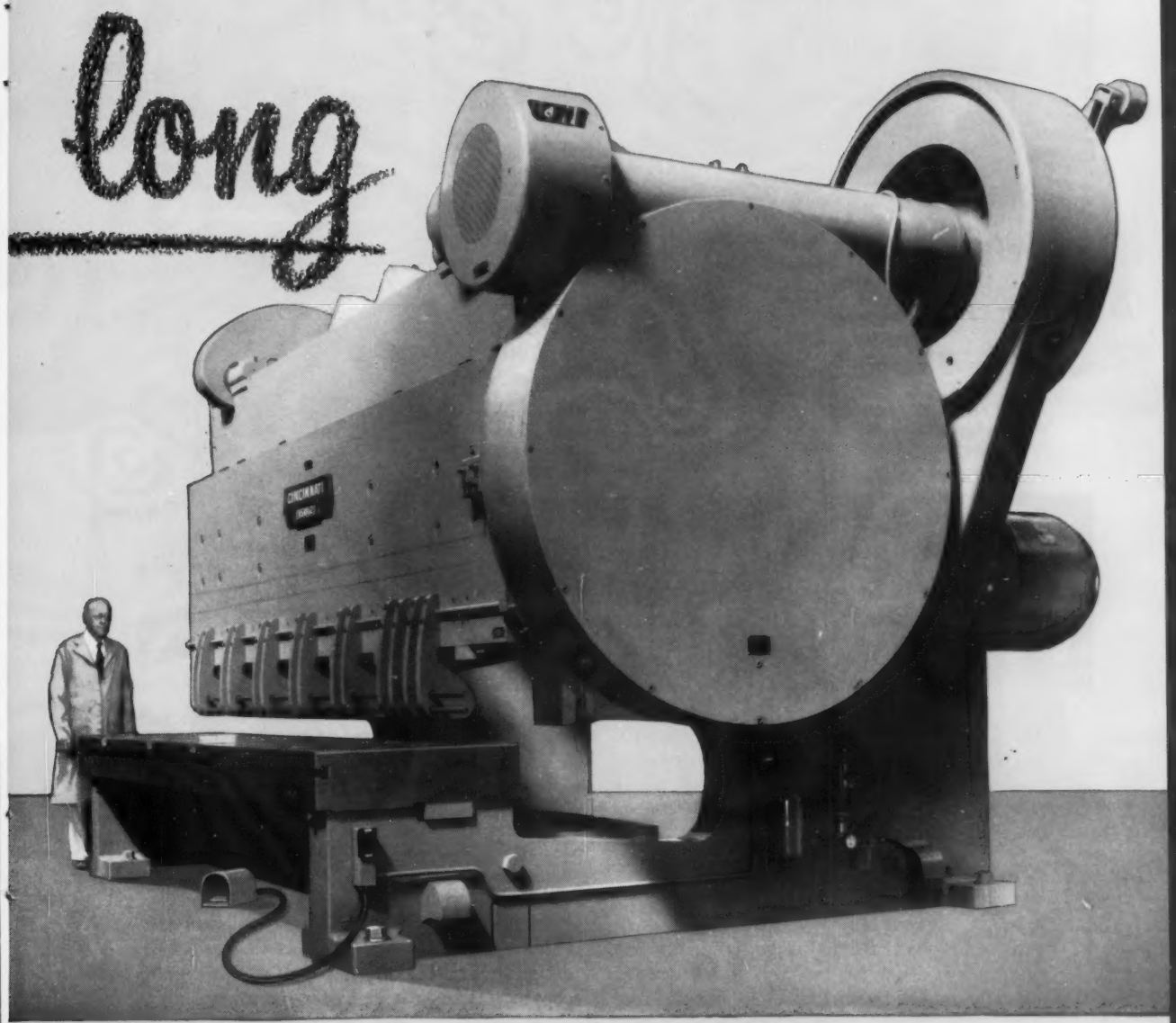
Write for Catalog S-7.

THE CINCINNATI SHAPER CO.

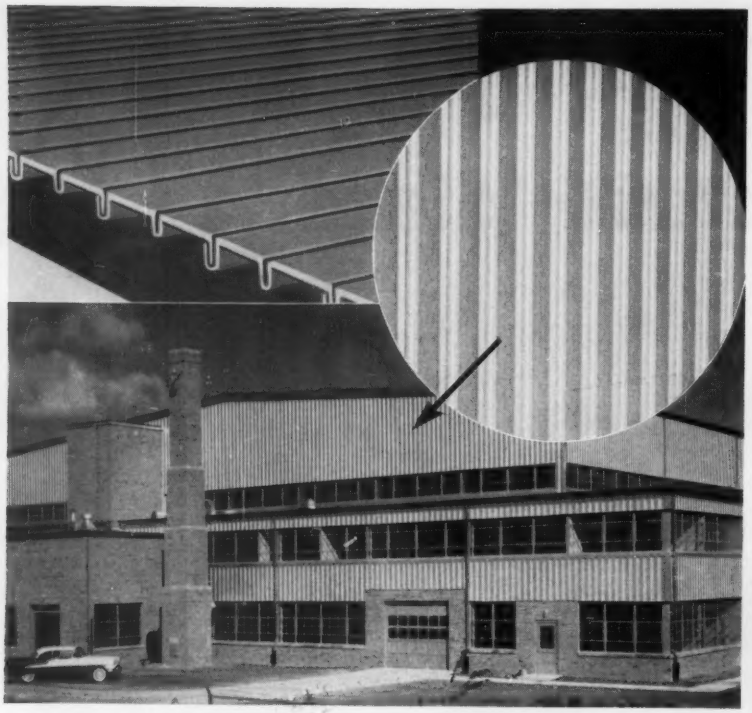
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

shears steel plate

long



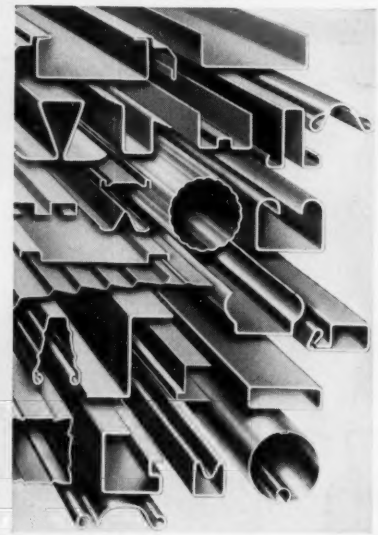
See your Cincinnati Representative for either Heavy or Light Shearing Applications.



(TOP) *Cross-section of cold-roll-formed Roof Deck by Walker Supply & Mfg. Co., Ecorse, Michigan.*

(INSET CIRCLE) *Aluminum siding panels, (made by Walker Supply & Mfg. Co.) give fine architectural effect.*

Elevator Door, Casing and Trim, by Dahlstrom Metallic Door Co., Jamestown, N. Y.



1001 things being done by COLD ROLL FORMING

The Cold-Roll Forming Machine is a powerful weapon in the hands of mass-production metal-working industries striving to fight inflationary forces with technological advances.

This applies even to the building industry, long considered immune to mass-production methods. The field abounds in opportunities for cost reduction through cold-roll forming of components for quick and easy assembly and erection on the job. The list includes, for example, specially designed wall, partition, floor and roof systems, nailable studs and joists, cabinets, closets, windows, doors and trim. It even includes exterior coverings, for architectural beauty as well as insulation and weather protection (see photo above).

The Yoder Book on Cold-Roll Forming contains numerous illustrations with information on the economic and mechanical possibilities of cold-roll forming, the machines and the tooling. Yoder has long been looked up to as the leader in designing and building all such equipment. A copy of the book is yours for the asking.

THE YODER COMPANY • 5504 Walworth Avenue, Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

COLD ROLL FORMING MACHINES
ROTARY SLITTING LINES
PIPE AND TUBE MILLS—Electric Weld

For more information fill in page number on Inquiry Card, on page 257

Less machining time and less spoilage

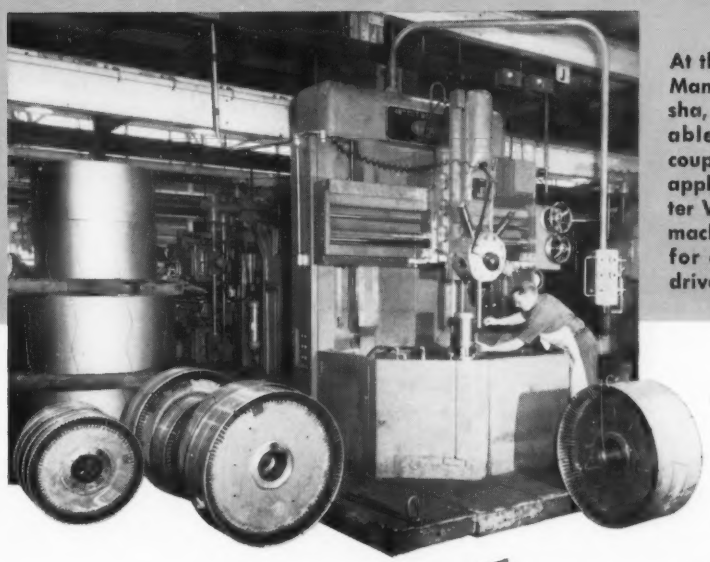
Results in

30% increase in production

With a.. BULLARD **...**

CUT MASTER V. T. L.

MODEL 75

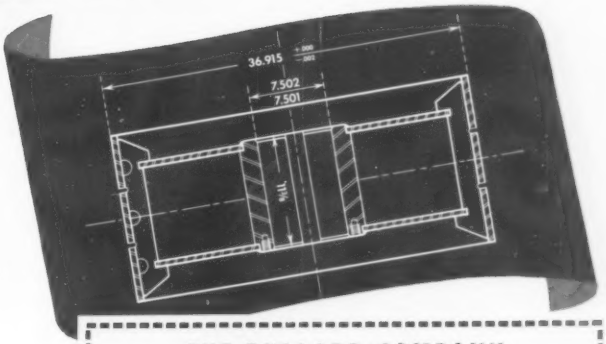


At the Dynamatic Division of Eaton Manufacturing Company at Kenosha, Wisconsin, producers of adjustable speed eddy-current drives, couplings and brakes for industrial applications, the Bullard Cut Master V.T.L., Model 75 is employed to machine the clutch rotor assembly for a big industrial punch press drive.

OPERATIONS

FIRST CHUCKING
1ST FACE HUB
2ND ROUGH & FINISH BORE
7.502" to 7.501"

SECOND CHUCKING
1ST FACE RIM
2ND ROUGH AND FINISH O.D.
36.915 +.000 —.002



Both operator and management praise the performance of the Cut Master, Model 75, "there's no comparison; the old machines I had to fight . . . this one holds once it is set. Setting up is easier and the controls are handy . . . it is easy to keep up work standards with a minimum of spoilage." The advantages embodied in the Bullard Cut Master V.T.L., Model 75 can be applied to your machining problems.

CALL YOUR NEAREST BULLARD SALES OFFICE OR DISTRIBUTOR OR SEND FOR COMPLETE CATALOG TO

THE BULLARD COMPANY
286 CANFIELD AVENUE — BRIDGEPORT 9, CONNECTICUT
Please send me a copy of the
NEW CUT MASTER V.T.L., MODEL 75 CATALOG

NAME _____

COMPANY _____ POSITION _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

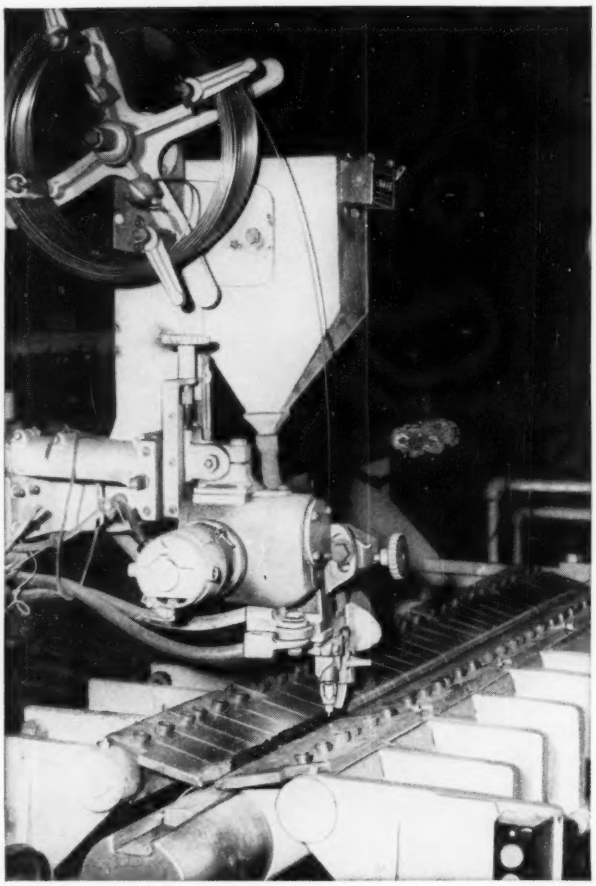
CUT *maintenance costs on tough welding jobs*

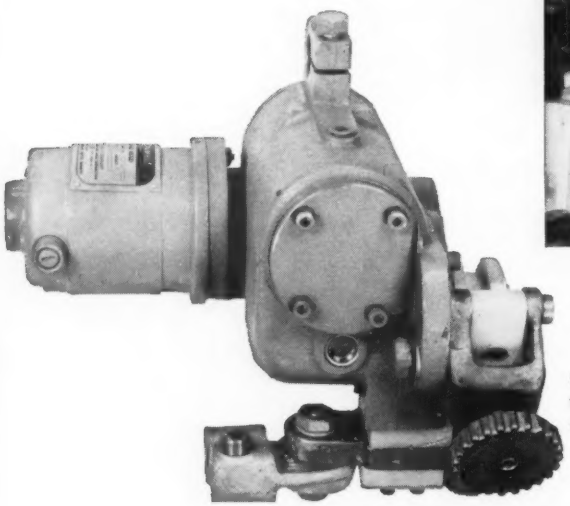
with the New UNIONMELT DSH *welding head*

Trade-Mark

Here's the low cost, submerged melt welding head that saves maintenance costs on tough welding operations. The new UNIONMELT DSH head combines the flexibility of the lighter units with the ruggedness needed in heavy-duty welding machines. Large, sturdy gears and bearings give long, trouble-free service though work may involve frequent starts and stops and feeding heavy electrode wire. Simple controls and mounting arrangements make the DSH head easy to operate and maintain.

UNIONMELT welding joins thin metals at speeds up to 200 in. per minute or makes one-pass welds with a 3-inch penetration if desired. If you have a production job in your plant that requires high-quality welds made at high speeds, ask your nearest LINDE Office today for more information about UNIONMELT welding. A LINDE Engineer will be glad to help you plan your UNIONMELT installation for high-speed, production welding.





With the new UNIONMELT DSH head now available in five output speeds, you can select the best unit you need for making high-quality low-cost welds at the highest welding speeds.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

(formerly Dominion Oxygen Company)

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde

Trade-Mark

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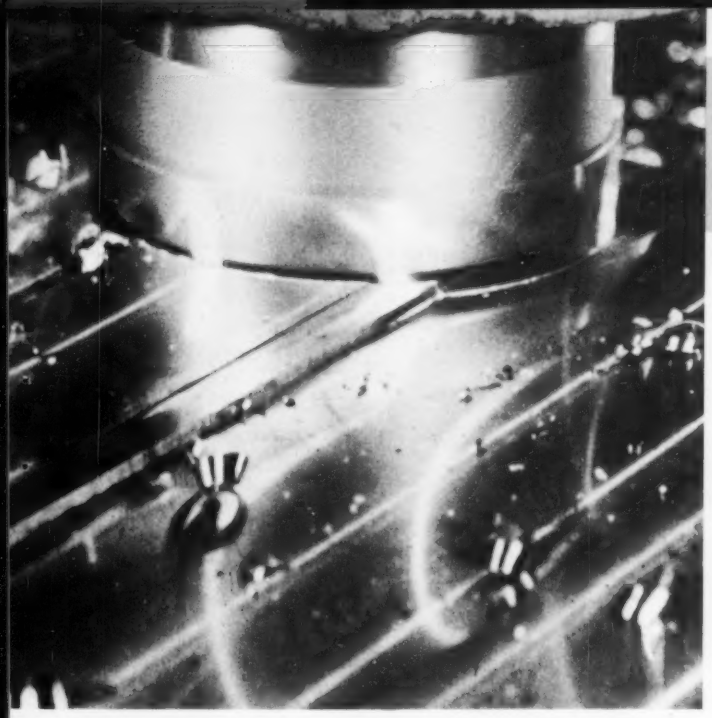
carbide NEWS



WESSON development cuts tool costs, down time and inventories in milling and boring

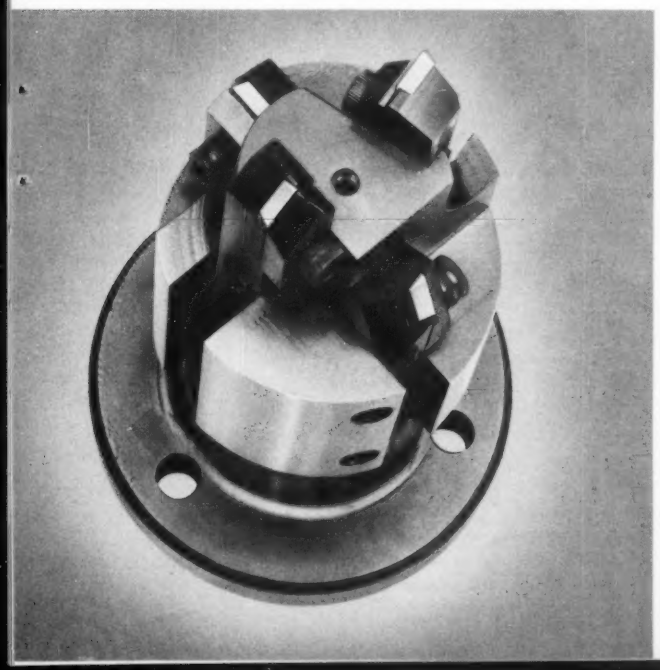
Throw-Away Insert Milling Cutters Eliminate All Grinding

A revolutionary new approach to carbide milling has been developed and is announced by Wesson Company, Detroit, with the introduction at the Tool Show in Chicago of Wesson Throw-Away insert milling cutters. These cutters, which like Wesson Throw-Away insert holders never require sharpening, are designed to handle the majority of all rough and finish milling operations on cast iron and steel.

Employing low-cost disposable Wessonmetal blades have eight quickly indexible cutting edges, the Wesson Throw-Away insert milling cutters provide a broad range of advances in milling practices. Following are some of the characteristics:

1. **High Speed Milling**—The design of the throw-away insert milling cutter permits high speed milling at high feeds. Negative radial and axial rake combinations provide ample clearance and give eight cutting edges on square blades.
2. **Low Tool Cost**—Blade cost is as little as 17 cents per cutting edge. By elimination of grinding, cost per piece is lower.
3. **Quick Setup**—Elimination of grinding and any need for complicated blade adjustment make rapid blade indexing possible, resulting in drastic reduction in set up time.
4. **Inventory Reduction**—Since cutters do not have to go back to cutter grind for re-sharpening, excess reserve inventory of cutter bodies is not required. Cutters, in some cases, can be maintained right at the machine. Efficient milling of both cast iron and steel, possible with the same cutter body using different carbide grades, also reduces inventory costs.

(continued on page 2)



Throw-Away insert boring tools were the second step in Wesson's evolution of a complete throw-away tool line. In use for more than a year these boring tools helped prove the applicability of the throw-away principle to multiple point and rotary tools.

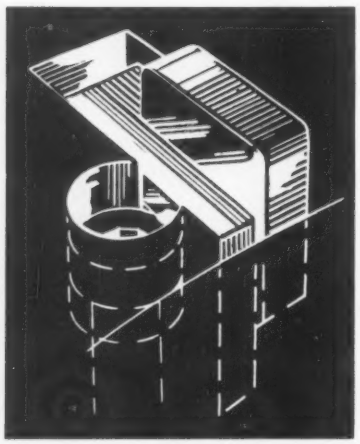
Throw-Away Insert

(*Continued from page 1*)

5. Standard Drive—In addition to their many advantages, Wesson Throw-Away Insert milling cutters can be used with present adapters and machines eliminating special conversion cost.

If you missed this revolutionary new development at the Tool Show or saw it and want more details, write Wesson today for complete illustrated literature.

Ask for Bulletin WC-356.



Assembled view of Throw-Away insert milling cutter blade, locking wedge and socket head screw shows rigidity achieved by full face bearing of the hardened steel locking wedge on the solid carbide tip.

New Holders Designed for Offset Machining

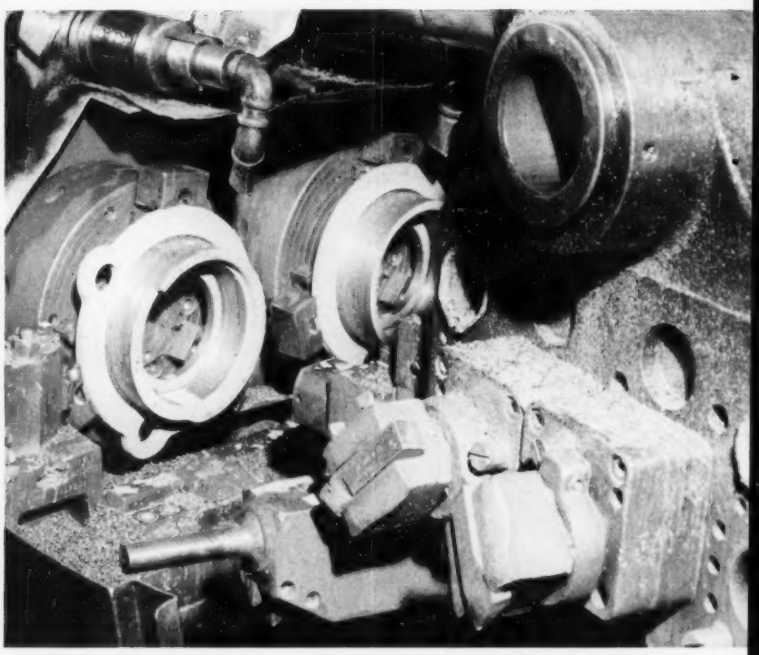
A new line of indexible carbide insert tools for offset turning and facing has been added by Wesson. Available in four sizes and right or left hand offset styles, holder models GAR and GAL are listed as semi-standard tools by the company.

Extensive field tests have proved the economy of the indexible insert offset holder over conventional offset tool types in reduced changeover time.

Ask for Bulletin GAR-GAL to get additional details of the new holder line.

tools Wesson carbide Wessonmetal
WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA: WESSON CUTTING TOOLS, LTD.
93 LEICESTER AVE., TORONTO 18, ONTARIO

Carbide Insert Tooling Slashes Machining Costs, Boosts Output



Output of final drive pinion bearing cages jumped from 40 to 400 per grind after change to solid carbide insert holders.

Production of tractor final drive pinion bearing cages jumped from 40 to an average of 400 pieces per grind and tool cost per piece dropped from $0.19 to $.0034 when a midwestern builder of road machinery switched to carbide insert-type holders at two stations on rough and finish machining operations. Wesson tools are used at all stations.

Rough and finish turning, facing, boring and chamfering of the bearing cages are performed on a 25 hp two spindle Potter & Johnson automatic turret lathe in five operations with two bearing cages being machined per set-up. The new insert-type tooling on four positions at stations #2 and #4, and brazed-type single point tools on all other positions use Wessonmetal Grade GS for roughing and Grade GI for finishing.

Average depth of cut for all roughing operations is ⅛". All roughing and finishing operations are being done in three feeds—.008", .012" and .018". Speeds used are 220 sfm for roughing and 380 sfm for finishing.

New No-Grind Tool Holder Bulletin Issued

Advantages and mechanical features of the new Multicut series of Throw-Away insert tool holders are described and illustrated in Bulletin No. 5510-M available from Wesson. Sketches and photographs are used to show holders, principal components and typical operations in which each of the six basic styles of holders are used. All holders are available from stock for either right or left hand use.

Separate tables for each holder give the sizes available, shank dimensions, prices of the holders only, insert catalog numbers and insert dimensions.

A large, illustrated composite table gives detailed information on the anvil locators, carbide tipped and steel clamps, taper head screws and clamp locking screws used with the various sizes and styles of the new Multicut holders. Also included are illustrations and tabular information on the standard round, square and triangular Wessonmetal Throw-Away inserts used with the various holders.

Scully-Jones Offers

PREMIUM CHUCK PERFORMANCE

AT NO PREMIUM IN PRICE!

These benefits . . .	for these reasons . .	result from these PREMIUM features
LONGER TOOL LIFE	Breakage reduced	1. New four-slot design increases resistance to pull-out approximately four times.
GREATER ACCURACY	Drills and taps run true	2. Greater number of slots permits chuck to close evenly on all sides and along shank of tool.
		3. Bore and shank are concentric within .002", gaged at distance equal to projection of standard jobber-length drill from the chuck.
	Accuracy of chuck lasts longer	4. Hardened alloy steel gives you best combination of spring collet action, high torsional strength, and sustained high accuracy.
INCREASED PRODUCTION	Downtime reduced	5. Improved seating and spring collet action of four-slot design facilitates easy tool changes.
		6. Four-way gripping action gives you greater protection against drill and tap breakage.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

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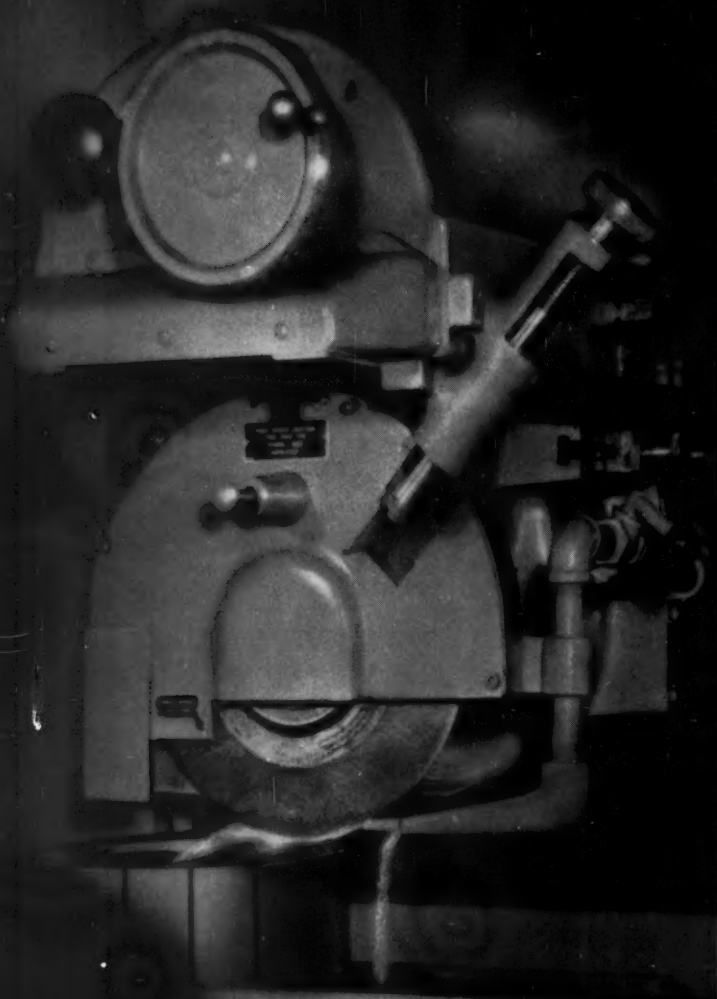
WORLD'S MOST COMPLETE LINE

# of hydraulic surface grinders



invites your attention...

name the surface grinding job... Thompson has the machine

Thompson Type B

Surface dies or parts faster to part print, at lower cost, within wide size range

work size

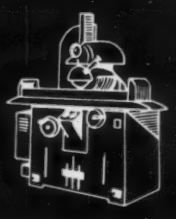
6″ x 18″
to
12″ x 120″

Thompson Type F

For greatest precision, sensitivity and versatility in toolroom... or parts production at low cost

work size

12″ x 40″
to
24″ x 168″

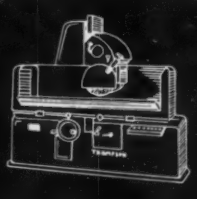


Thompson Type C

Meets production and cost demands in larger size surface work of all types

work size

8″ x 18″
and
8″ x 24″

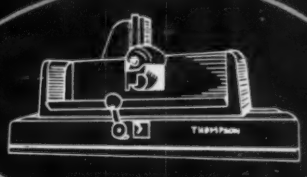


Thompson Type CX

Offers both power and precision for heavy duty production... fast, accurate

work size

30″ x 72″
to
36″ x 240″



Thompson SURFACE Grinders

Including a complete line of Truform, Hydrail, Hydrovert, Twin Rotary and other special grinders for all sizes and types of work.

write for descriptive data

THE THOMPSON GRINDER COMPANY

SPRINGFIELD, OHIO

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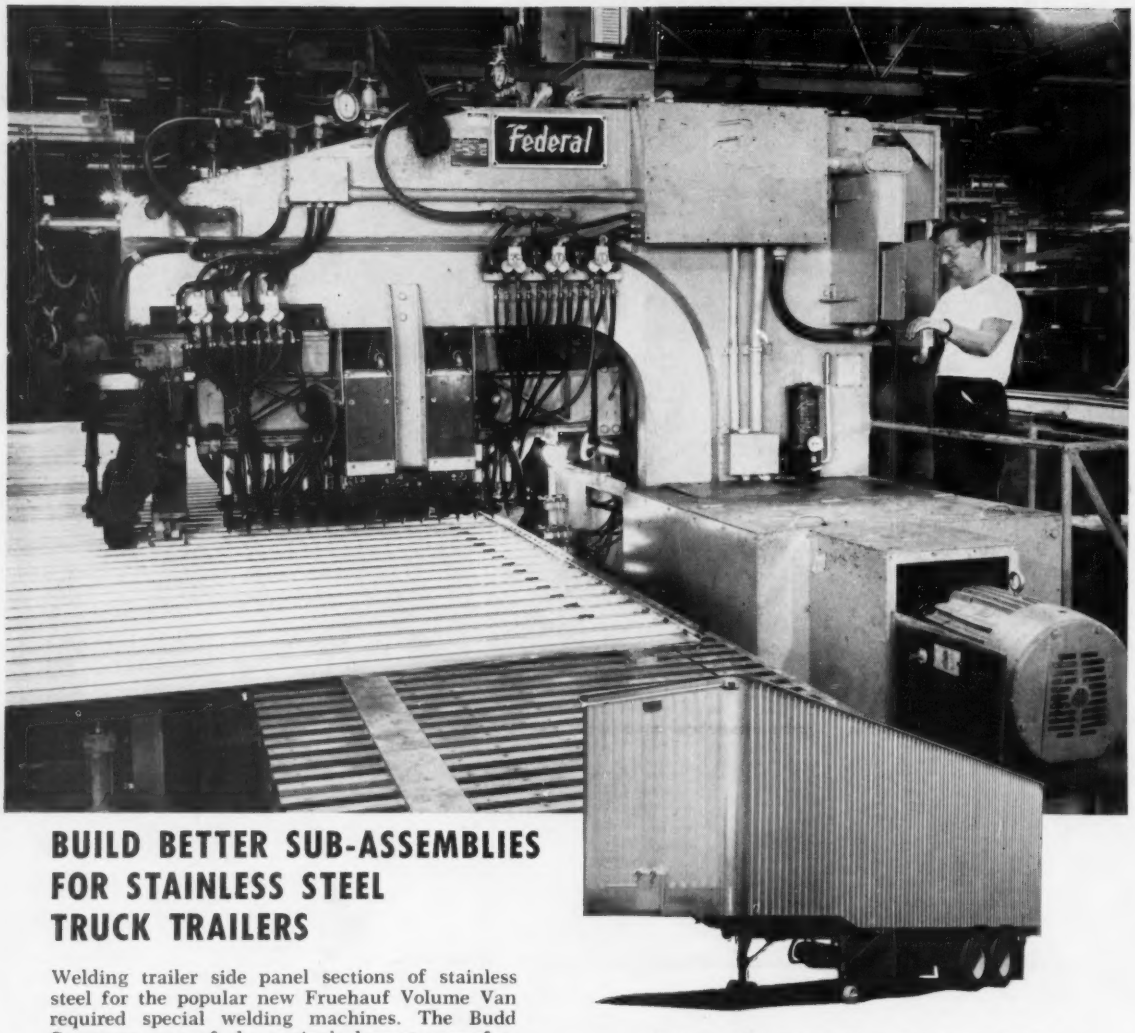
How -Federal- Helps Budd...



BUILD BETTER SUB-ASSEMBLIES FOR STAINLESS STEEL TRUCK TRAILERS

Welding trailer side panel sections of stainless steel for the popular new Fruehauf Volume Van required special welding machines. The Budd Company, one of the nation's largest manufacturers of transportation equipment, naturally, turned first to Federal.

Federal, in cooperation with Budd, designed and built an ingenious "C" frame multi-spot traveling welder that turned the difficult job of welding side frame panels and structural skirt sections into a high production operation.

Self-propelled on 120 feet of rail, the machine travels over the work which is laid horizontally on a copper shunt die back-up fixture. It features an adjustable slow speed for indexing with a rapid traverse for return. Two rows of tandem piston, double-acting air guns are indexed at right angles to the line of welder travel to permit close spot welding. The machine automatically positions itself and selects gun sequence. Operator, riding with the machine, always has clear view of work, ready access to controls.

Stainless steel sub-assemblies for the Fruehauf Volume Van (above) are fabricated by the Budd Company for Fruehauf.

If your operation calls for special resistance welding — you, like leading manufacturers, should call on *Federal — First in Resistance Welding.*

WELDING SHOW

Booth No. 73

THE FEDERAL MACHINE AND WELDER COMPANY

WARREN, OHIO

-Federal- WELDERS ®

Warco PRESSES ®

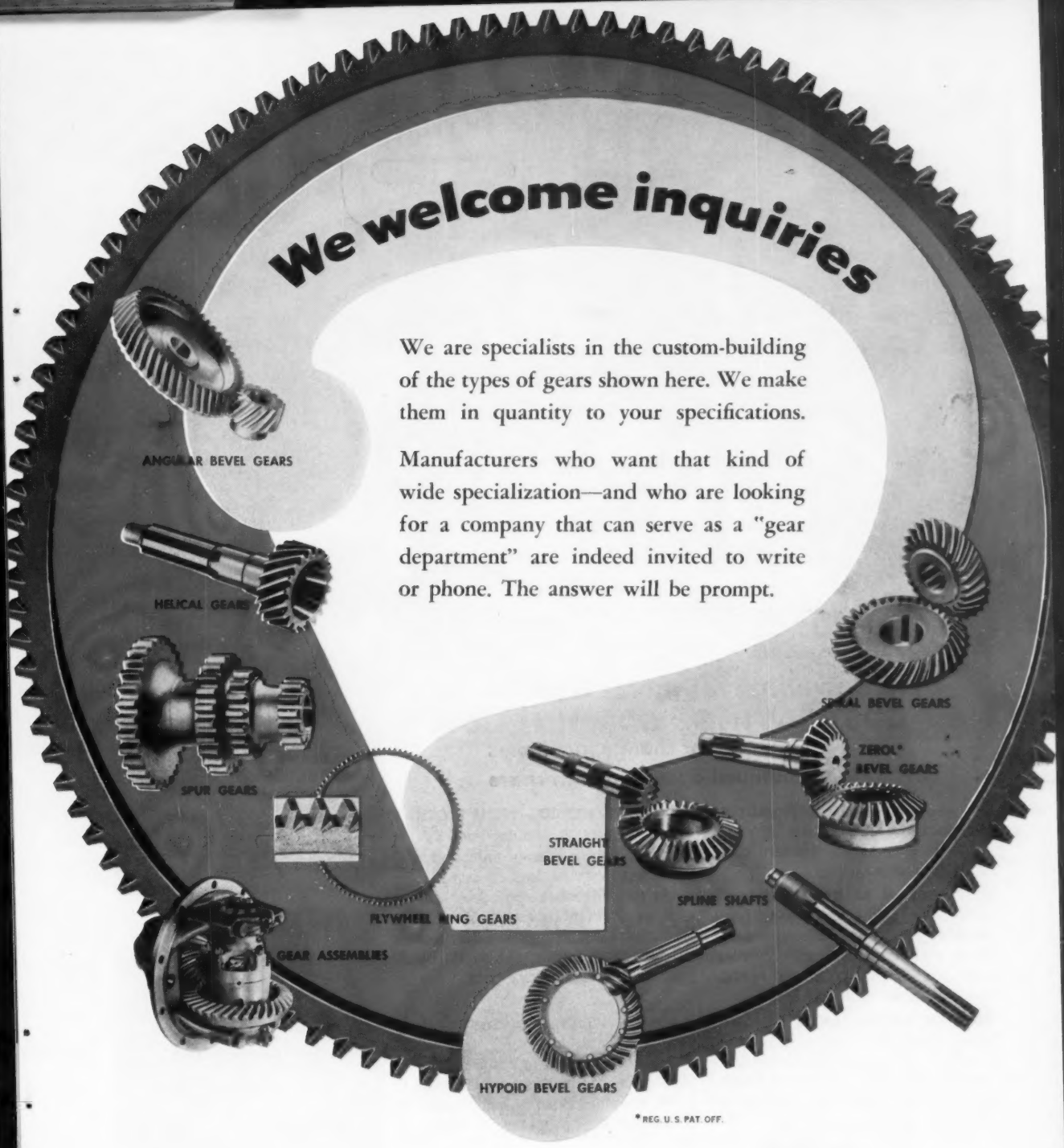
9801

For more information fill in page number on Inquiry Card, on page 257

We welcome inquiries

We are specialists in the custom-building of the types of gears shown here. We make them in quantity to your specifications.

Manufacturers who want that kind of wide specialization—and who are looking for a company that can serve as a "gear department" are indeed invited to write or phone. The answer will be prompt.



*REG. U. S. PAT. OFF.

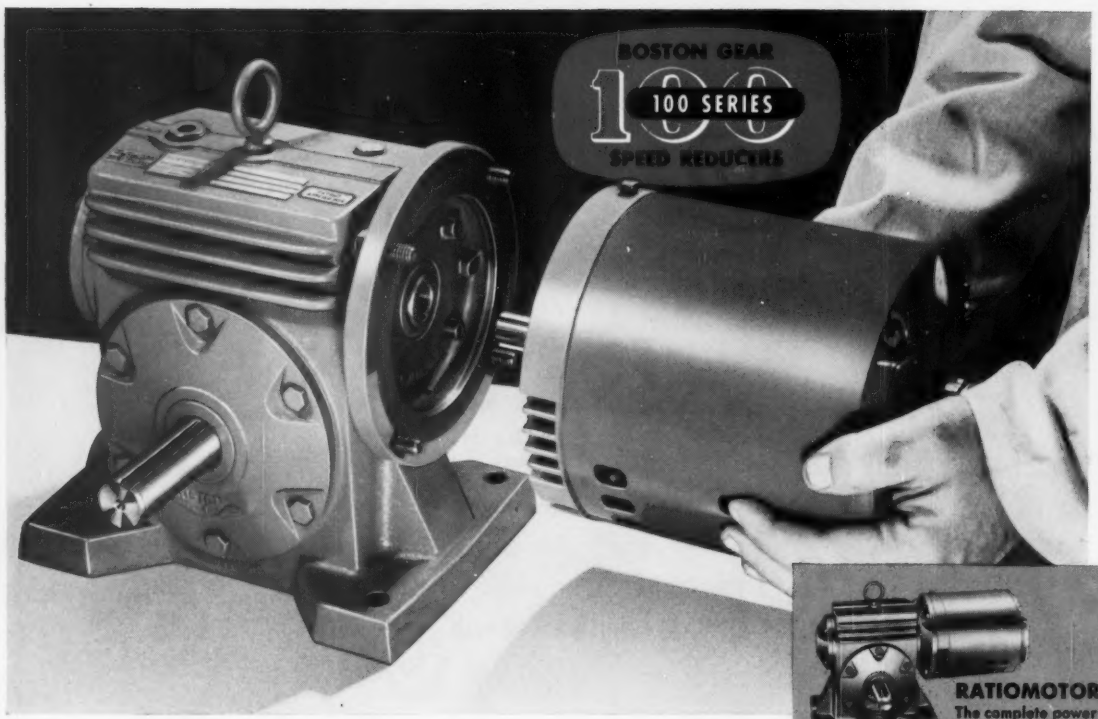
DOUBLE DIAMOND GEARS

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA



No downtime for motor repairs!

New COST-SAVING "COMBINATION"

permits motor change in minutes . . . continued operation with spare

The new 100 SERIES RATIOMOTOR combines a gear reduction unit and an easily detachable, standard end-mounted motor.

MOTOR CAN BE REMOVED and replaced in a few minutes, without disturbing the gear reduction unit. Saves maintenance time, preserves alignment, permits continued operation with spare motor.

ORIGINAL MOTOR CAN BE CHANGED When conditions require change to a motor of special characteristics (totally enclosed, explosion-proof, etc.) it can easily be attached in place of the original motor.

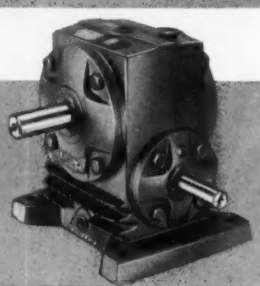
ANY MODEL NEEDED – FROM STOCK The 100 SERIES includes 1064 different *standardized stock* units for an unlimited range of applications . . . Reductors, for mechanical drives, as well as Ratiomotors and Flanged Reductors. All ratings are *certified* to be actual torque delivered, by Independent Laboratory tests.

A BOSTON GEAR FIELD ENGINEER will help you simplify planning, and put your product ahead in design. Your Boston Gear Distributor will arrange a call, or write: Boston Gear Works, 65 Hayward St., Quincy 71, Mass.

RATIOMOTORS
The complete power package, with motor.

SOLD WITH OR WITHOUT MOTOR

FLANGED REDUCTORS
The Ratiomotor gear unit, supplied without motor. You buy and attach any motor you choose.



REDUCTORS
For mechanical drives, new 100 SERIES design saves space and weight. Housings are finned for improved cooling. Fan-cooling optional on larger sizes.

MAXIMUM HORSEPOWER PER DOLLAR
Certified
by Independent Laboratory tests

GET NEW CATALOG R-56
Lists models for any drive . . . horizontal or vertical—right angle or parallel—single or double reduction. Includes selection charts, engineering data.

1064 DIFFERENT UNITS
108 MODELS – FROM *STOCK*

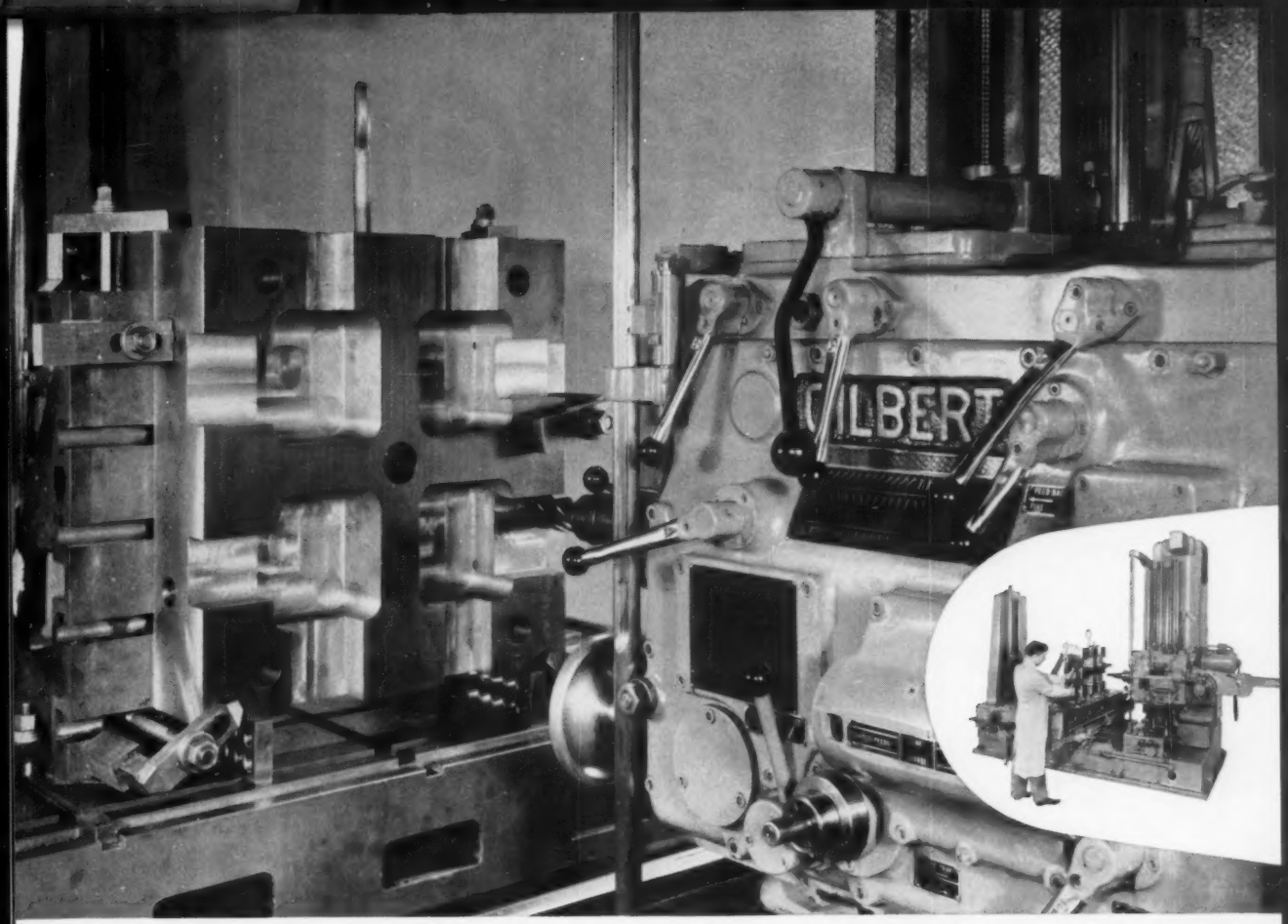
Call your **BOSTON** *Gear* **DISTRIBUTOR**

PATENTS PENDING

For nearest distributor, look under "GEARS" in the Yellow Section of your Telephone Directory.

55-BG-R-17A

For more information fill in page number on Inquiry Card, on page 257



courtesy Mohawk Tool & Die Corporation and Macaulay Machinery Co.

30 percent savings and ±.001"

...match it with a Gilbert

How's this for a perfect lineup: 30% savings in floor-to-floor time over previous machines, and ±.001" for mating the two chases of a four-cavity carburetor bowl mold.

Mohawk Tool & Die Corp., Rochester, N.Y., gets these savings and accuracy by handling the job on a Cincinnati Gilbert horizontal boring mill.

Here the lower chase (of hot work die steel) is being rough machined. Then it's hardened to a Rockwell of 48-50C scale. Finally, the chase is finish machined with carbide to an accuracy of ±.001" for guide pin and bushing holes, four cavity pockets, and eight slide ways.

Says Mr. George Neward, Mohawk's Secretary-Treasurer: "This job illustrates the flexibility of this type of machine. The ruggedness and stability of the Cincinnati Gilbert has been proven to us without doubt."

The comparatively low cost of adding these advantages to your operations will surprise you. Write for new literature, or—better yet—get a proposal from Gilbert now.

The Cincinnati Gilbert Machine Tool Co.,
3366 Beekman Street, Cincinnati 23, Ohio

You can buy a new compound table type Gilbert horizontal boring mill on a 5-year payment plan for as little as $5580 down and $428.36 a month. This is $1.28 an hour on a two 8-hour-shift operation. Includes low 6% simple interest (3% add on).

those who buy Gilbert buy **GILBERT** *again*

New LeBlond High Speed Spindle Mounting—front and center bearings are Timkens in cone-adjusted mountings. Center bearing cup is mounted in special adaptor which relieves potential excessive preload resulting from the heat of high speed operation. Rear mounting is thrust bearing.

before you buy a lathe for high-speed carbide turning... check spindle bearing design

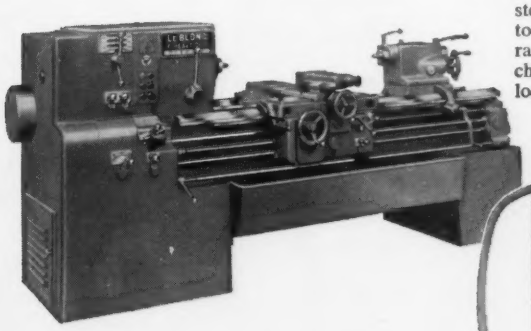
LeBlond construction gives you safe high speeds with long-lived precision. Higher and higher speeds for efficient carbide turning—that's the order of the day in lathe design. But when you talk about 2000 rpm on a 16″ H.D. lathe, you've got to think about the new problems created by high speeds.

Heat, generated in a hurry, produces different rates of expansion radially and axially in the bearings and spindle. As a heavy spindle is revved up to 2000 rpm, heat is generated in the bearings. Expansion occurs radially in the bearings and spindle before the heat has time to dissipate and cause a proportionate axial expansion in the spindle. *This is the dangerous interim period!* Unless the bearings can be relieved, excessive preload may cause undue wear and loss of precision. Even failure in the extreme case.

Here's how LeBlond solves this problem. The front Timken bearing is mounted on the spindle and directly in the headstock. The center bearing cup is mounted in an adaptor (A) whose land is .004″ smaller in diameter than the headstock bore. The other end of the adaptor is press fitted. As the bearing temperatures rise in operation, the center bearing and adaptor expand radially into the slight clearance. Both front and center bearings are thus relieved from extreme preload—failures due to excessive tightness and wear are eliminated. The original factory-set preload can handle both high and low speeds—no need to reset bearing adjustments in the field.

This is typical of the under-the-surface quality engineered into every detail of LeBlond Lathes. To give you the operating speeds you need, with the safety, precision and long life you expect when you purchase a LeBlond.

Whatever your turning needs, high speed, high horsepower or high production, LeBlond has a lathe in its complete line to do the job. 76 different models to choose from. See your LeBlond Distributor or write today.



Other important features of the new LeBlond 16″ Heavy Duty Lathe include combination gear-belt drive headstock, 18 geared speeds, 9 timing-belt-driven speeds up to 2000 rpm, free running spur gear design, four-way rapid traverse, one-piece apron, totally-enclosed quick-change box, hardened and ground steel bedways, thrust-lock tailstock. Ask for Bulletin HD-126D.

. . . cut with confidence

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY • CINCINNATI 8, OHIO

World's Largest Builder of a Complete Line of Lathes • for more than 69 years

Guaranteed Accuracy

More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

Inquire into the advantages of SIP High Precision Equipment for your plant. Call your local SIP Representative, or write directly to us.

HENRY & WRIGHT
DIVISION OF EHMART MANUFACTURING COMPANY

CANADAIR
— AIRCRAFT MANUFACTURERS —

AXELSON

Thompson Products, Inc.

GRENDA ENGINES

DRAPER CORPORATION

THE Portage MACHINE CO.

Rheem
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Excellence in Electronics

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ARNOLT CORPORATION

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SHEAFFER'S
WHITE DOT OF DISTINCTION

Ford

HUGHES
AIRCRAFT COMPANY
CULVER CITY, CALIFORNIA

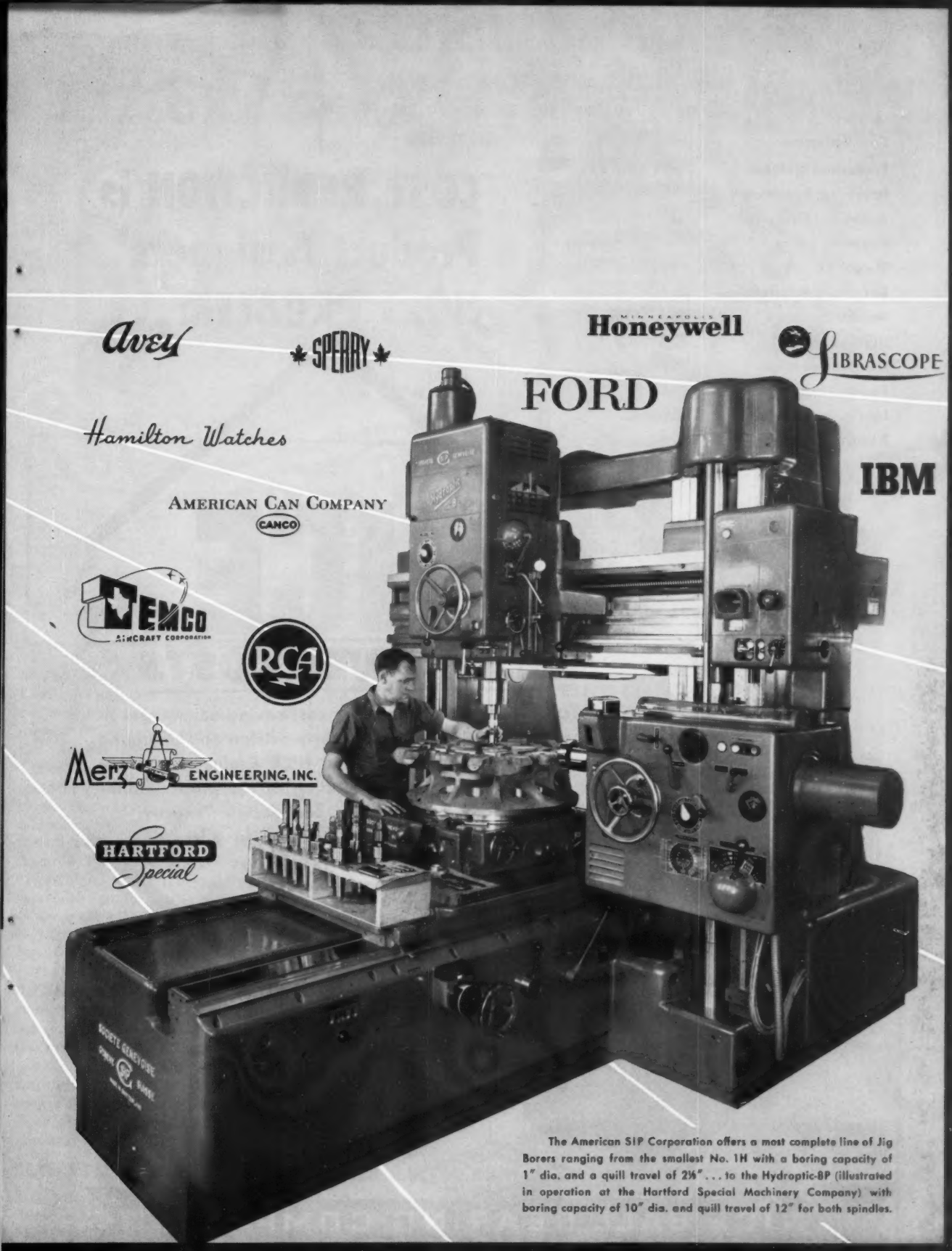
LINK
AVIATION INC

DACO

MOTCH & MERRYWEATHER

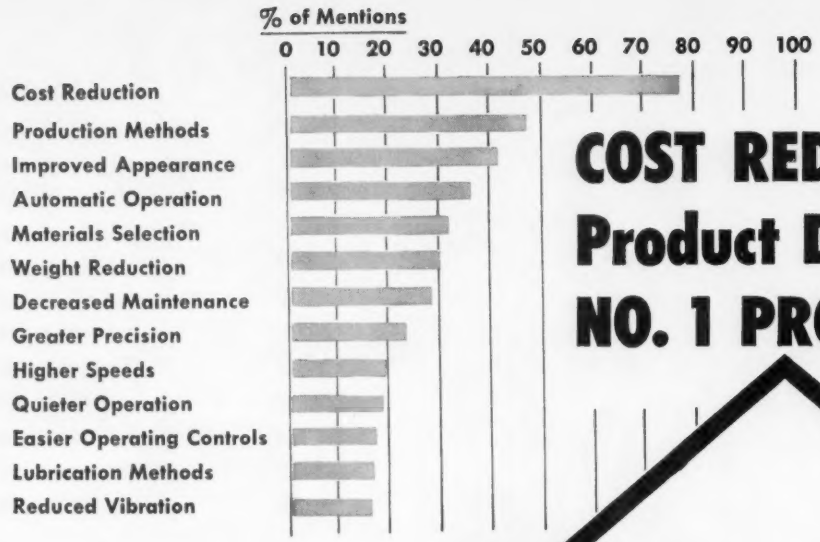
BOEING

THE AMERICAN SIP CORPORATION *High Precision Machine Tools*



The American SIP Corporation offers a most complete line of Jig Borers ranging from the smallest No. 1H with a boring capacity of 1" dia. and a quill travel of 2½"... to the Hydroptic-8P (illustrated in operation at the Hartford Special Machinery Company) with boring capacity of 10" dia. and quill travel of 12" for both spindles.

and Measuring Equipment 100 EAST 42nd STREET, NEW YORK 17, N. Y.



Tabulated results of a recent survey showing the problems receiving greatest attention from Product Designers.

COST REDUCTION is Product Designers' NO. 1 PROBLEM . . .

AND NICE CAN HELP LOWER COSTS

Product Designers will find many cost-saving advantages in the use of NICE precision, semi-precision and unground ball bearings. Experienced NICE Engineers can not only help in the selection of the proper standard bearings, but can design "exactly right" special bearings to meet particular application requirements.

WRITE FOR CATALOG No. 150

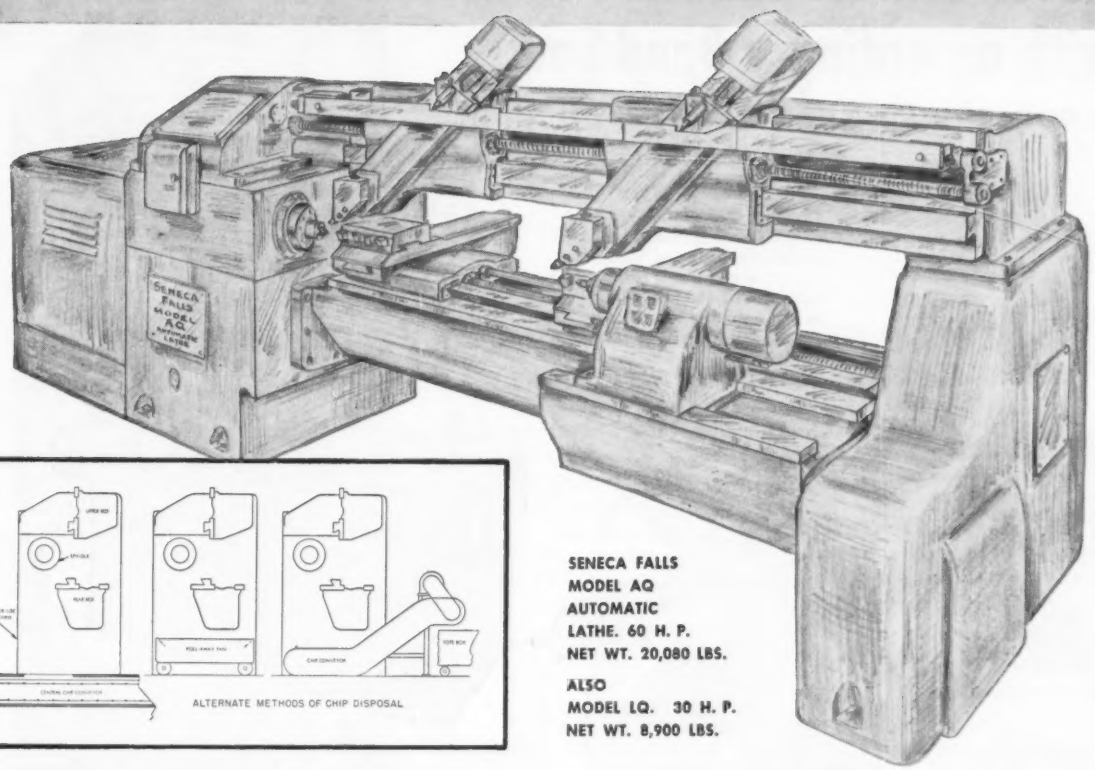
NICE

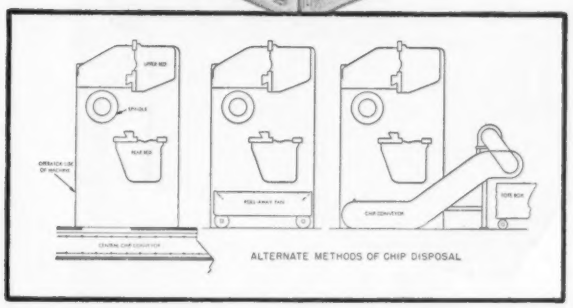
NICE BALL BEARING COMPANY

NICETOWN · PHILADELPHIA · PENNSYLVANIA

For more information fill in page number on Inquiry Card, on page 257

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS





ALTERNATE METHODS OF CHIP DISPOSAL

SENECA FALLS
MODEL AQ
AUTOMATIC
LATHE. 60 H. P.
NET WT. 20,080 LBS.

ALSO
MODEL LQ. 30 H. P.
NET WT. 8,900 LBS.

● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The roughing operation is accomplished with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic . . . the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.

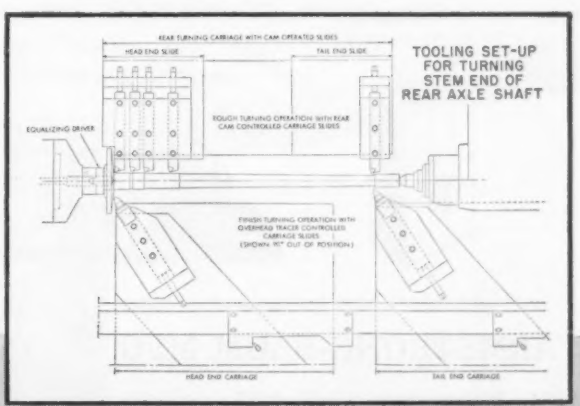
A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements,

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

WRITE FOR BULLETIN AX 56B

DESIGN FEATURES

- ▶ **Simplified changeover features for reduced set-up time.**
- ▶ **Feed rate may be automatically changed during cutting cycle.**
- ▶ **Streamline design for efficient chip guarding.**
- ▶ **Screw feed to all carriages.**
- ▶ **Four speed head with automatic change-over.**
- ▶ **Large chip flow area.**
- ▶ **All templates clear of chip area.**
- ▶ **All ways hardened, ground and replaceable.**
- ▶ **Open front design facilitates loading and unloading.**
- ▶ **Straight line diameter adjustment for tracer tools . . . no shoulder length change to correct.**


TOOLING SET-UP FOR TURNING STEM END OF REAR AXLE SHAFT
HEAD END SLIDE
TAIL END SLIDE
EQUALIZING DRIVER
ROUGH TURNING OPERATION WITH REAR CAM CONTROLLED CARRIAGE SLIDES
HEAD END CARRIAGE
TAIL END CARRIAGE

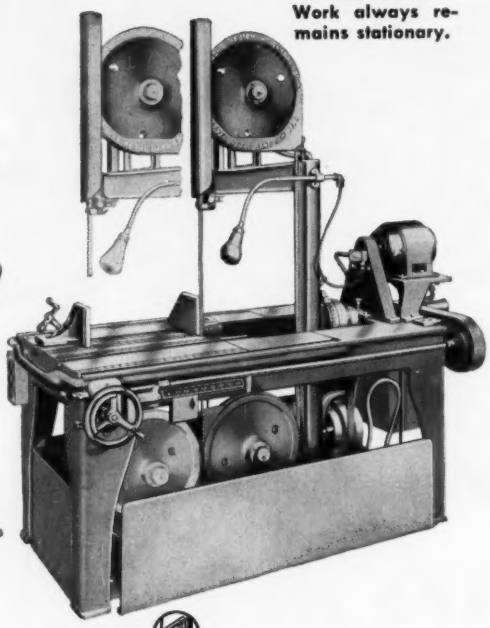
NEW SENECA FALLS
MODEL LQ AND AQ AUTOMATIC LATHES

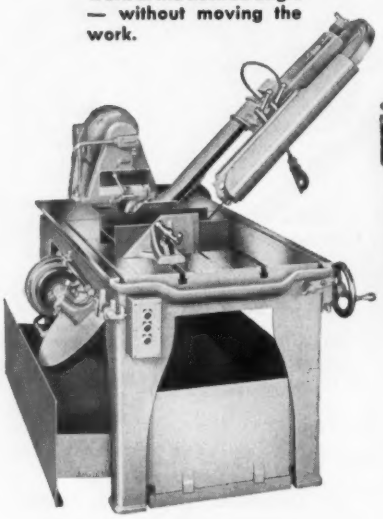
Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

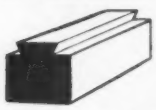
Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.





Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section

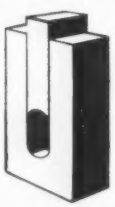


Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams.



Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

now...

VALUABLE DIE-SET DATA FOR ALL TOOL ENGINEERS

It's easy-to-look-at! More than 200 pages are specially edited and arranged for quick and simple reference. Full color is used to make tables easier to read, illustrations more clear. The easy-to-look-at format plainly indicates all optional features. Covering the complete Danly "Leadership Line", this catalog presents full dimensional data and specifications for all Danly Die-Sets, Diemakers' Supplies, Bolster Plates and Bolster Plate Accessories. Get your copy of this new easy-to-look-at Danly catalog. *Write for it today.*

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DIE SETS AND DIEMAKERS' SUPPLIES

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DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Ave., Dept. C Chicago 50, Ill.

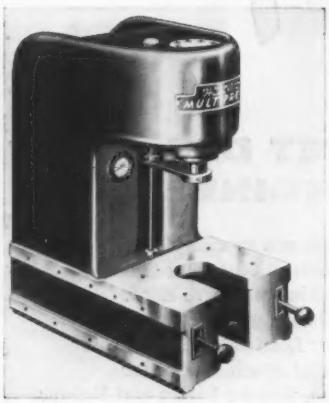
Another production improvement with

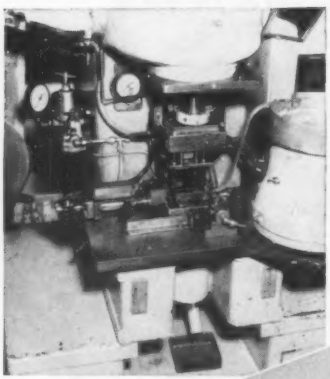
DENISON

MULTIPRESS

Multipress® Automation turns out 48,000 assemblies a day

Denison Multipress pierces, forms, cuts off, positions and spot welds stainless strap to washers





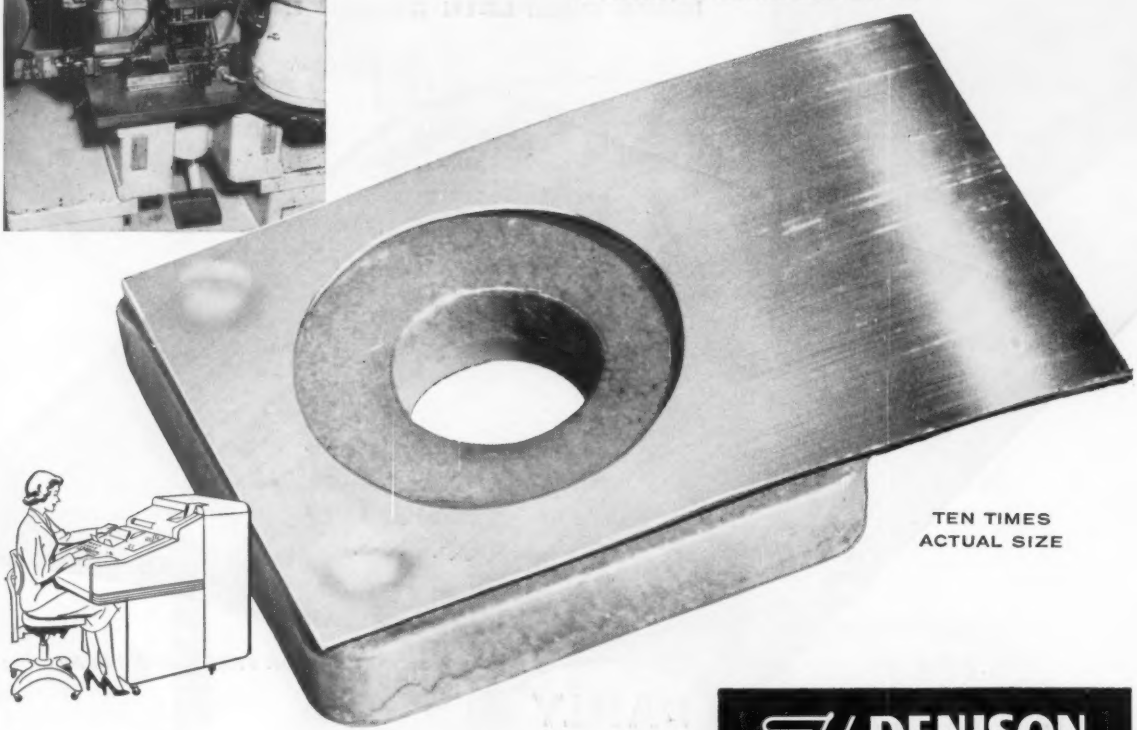
100 assemblies per minute . . . that's the production turned out by one Denison Multipress at International Business Machine Corporation, Poughkeepsie, New York.

Stainless steel tape is fed through a hitch feed into a punch and die set where it is pierced, shaped, and cut off forming a damper guard to cushion the action of a relay armature. It is then positioned under welding electrodes and welded to a square steel washer.

All operations are automatic . . . accurately timed to the stroke of the ram.

Ask a Denison field engineer to show you how to put Multipress to work in your plant. He will demonstrate exactly where and how you can save money on your operations . . . now. Write us.

THE
DENISON ENGINEERING COMPANY
1244 Dublin Road • Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.



TEN TIMES
ACTUAL SIZE

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

DENISON HydrOILics

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CLEVELAND *Carbide* TOOLS

Drills • Reamers • End Mills • Counterbores

These superior tools retain a sharp edge under high temperatures and have excellent resistance to abrasion. In addition to regular tools, both solid carbide and carbide tipped, there are many CLEVELAND Carbide Tools for special purposes.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

Request your copy of this descriptive new booklet on CLEVELAND Carbide Tools

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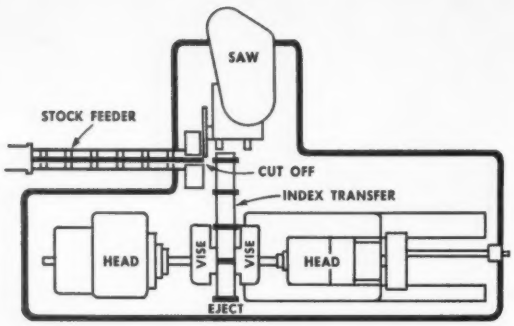
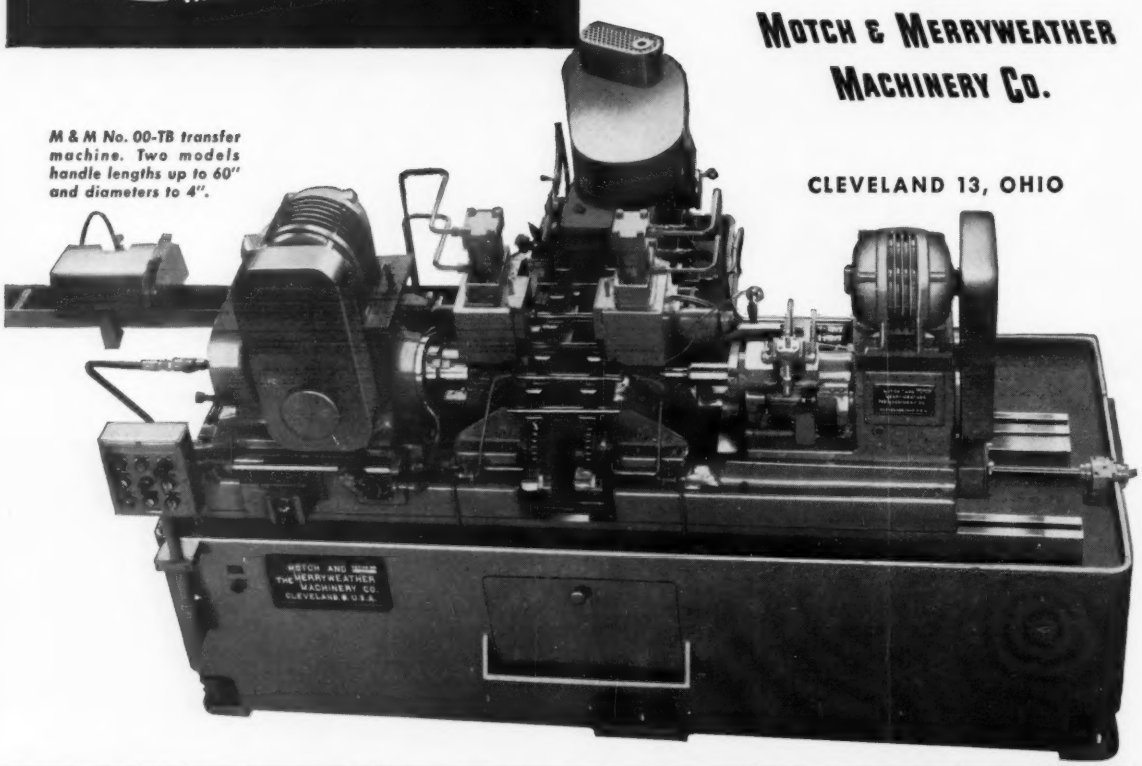


HOT BED OF ACTIVITY

Motch & Merryweather's new transfer machine widens the horizon for the simultaneous double-end machining of bar stock or tubing. Combined with cut-off to accurate length are: centering, chamfering, turning, drilling, or boring. Box mill turning is performed along with center drilling and chamfering. From stock pile to discharge, all operations can be fully automated. For the quickest answer to speed your stock processing, send us your part drawing.

THE MOTCH & MERRYWEATHER MACHINERY CO.

CLEVELAND 13, OHIO



M & M No. 00-TB transfer machine. Two models handle lengths up to 60" and diameters to 4".

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, AND SPECIAL MACHINERY

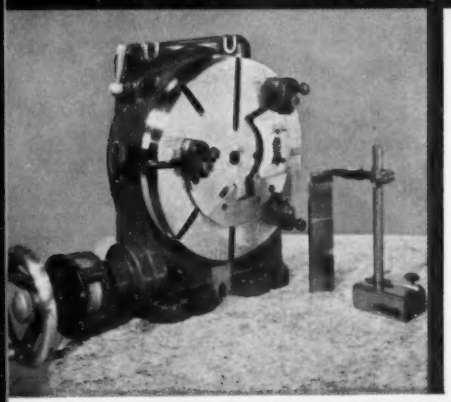
MOORE

Presents a Rotary Table Accurate to ±3 sec. in 360°

(USING CHART)

Packaged for protection and convenience

NO. 2 MOORE 11-INCH ROTARY TABLE



Accurate in horizontal or vertical position

The following accuracy built for shop use:

All points in 90° increments, from 0, ±1½ sec.
All points in 18° increments, from 0, ±2 sec.
All points in 2° increments, from 0, ±4 sec.

Worm accuracy, ±1 sec.
Repetition of settings, ±1 sec.
4 sec. = .0001" on 10" dia.

Write for 8-page, 4-color brochure, of which this is the front cover.

Moore Special Tool Company, Bridgeport 7, Conn.
Builder of the Jig Borer and Jig Grinder

ANNOUNCING the CHECK MASTER

ACTUAL SIZE

PATENT PENDING

AN ALL NEW TEST INDICATOR

by STANDARD

1. Light contact pressure (15 grams standard), uniform for both directions of contact point.
2. Contact positions over full 180 degree arc. Points interchangeable.
3. Clockwise movement of hand for both directions of contact point. Directional reverse-lever eliminated.
4. Indicator graduated to .0001″, range .008″—unusually sensitive, responding to dimensional variations of .000020″.
5. Exceptionally versatile mounting holder.

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MEASURING INSTRUMENTS FOR PRECISION INDUSTRY

92 PARKER AVE. POUGHKEEPSIE, N. Y.

STANDARD® Gages

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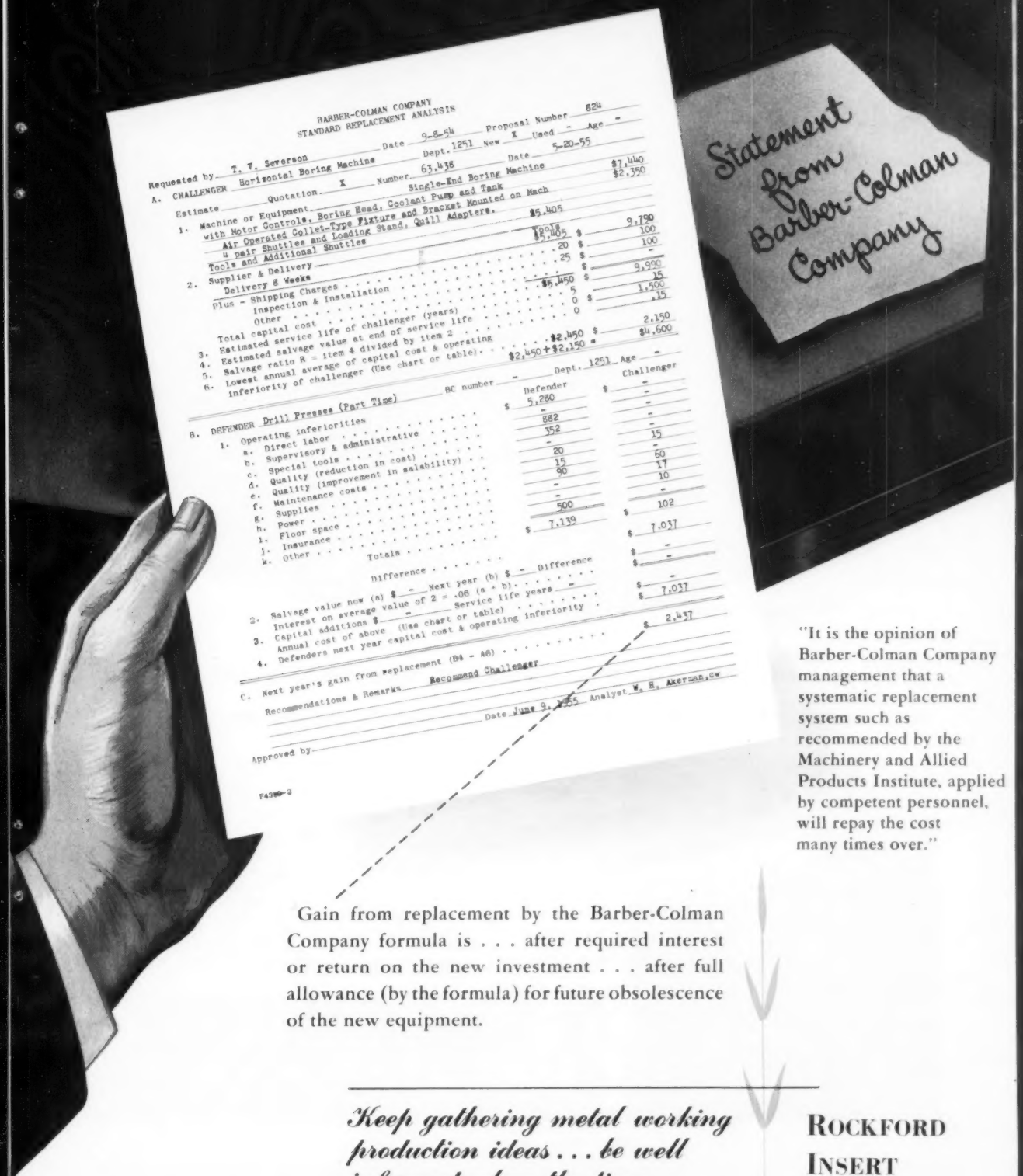
How the BARBER-COLMAN COMPANY Reduces Their Cost Savings Opportunities to Careful Analysis



"It is the opinion of Barber-Colman Company management that a systematic replacement system such as recommended by the Machinery and Allied Products Institute, applied by competent personnel, will repay the cost many times over."

Gain from replacement by the Barber-Colman Company formula is . . . after required interest or return on the new investment . . . after full allowance (by the formula) for future obsolescence of the new equipment.

Keep gathering metal working production ideas . . . be well informed when the time for replacement arrives.

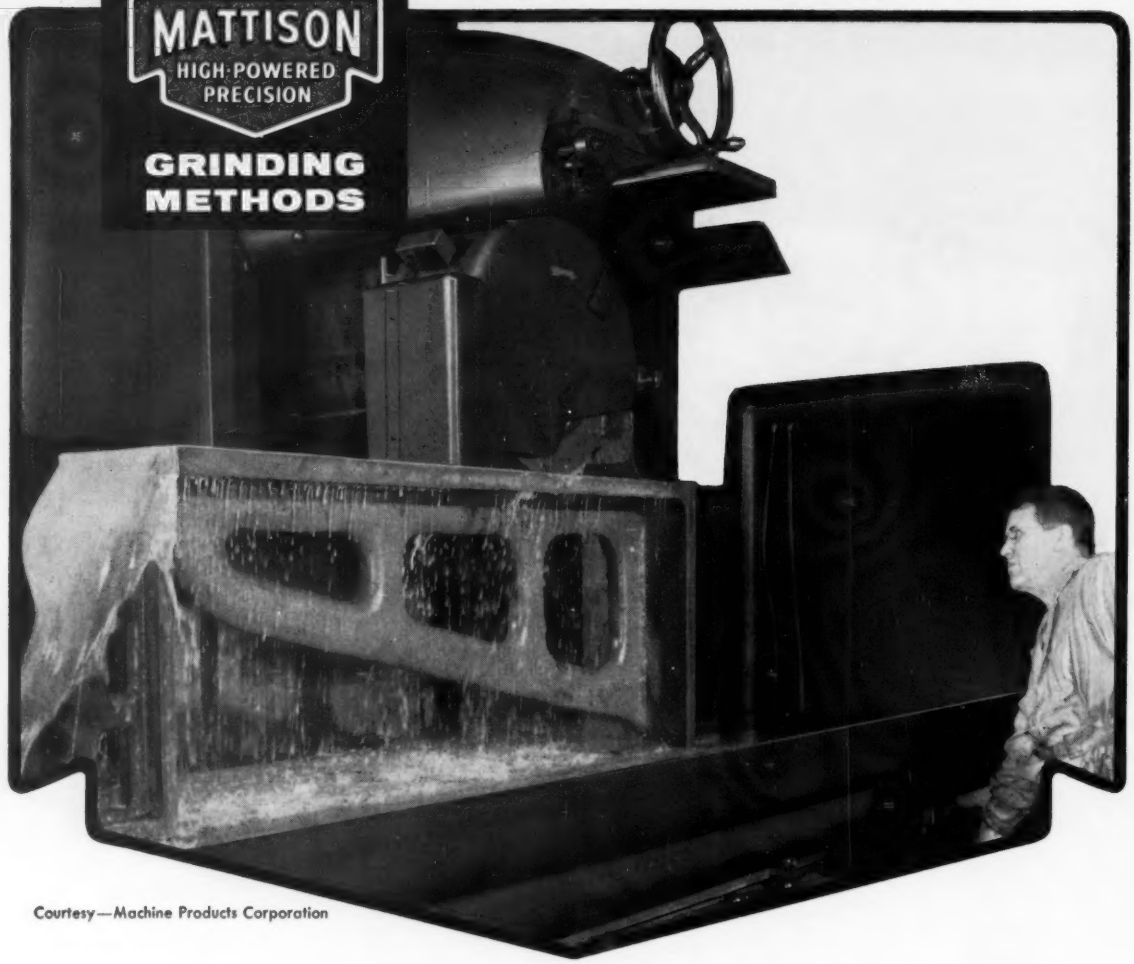
ROCKFORD INSERT GROUP

April, 1956

CASE HISTORY·NO. 13—MEEHANITE PLANE ANGLES

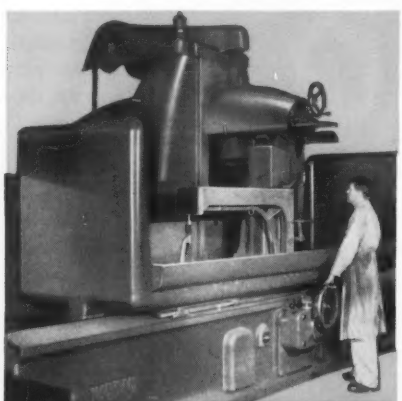
MATTISON
HIGH-POWERED
PRECISION

GRINDING METHODS



Courtesy—Machine Products Corporation

Accurate, smooth operation speeds production of difficult-to-grind precision parts



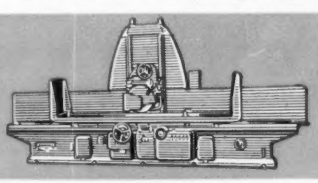
This plane angle is made of aluminum and ground to a 25 micro inch finish. It is typical of the close tolerance work done on this grinder.

Smooth operation that permits accurate grinding of oddly shaped, difficult-to-hold pieceparts is one of the greatest advantages in the use of a Mattison High-Powered Precision Surface Grinder, according to a Detroit manufacturer of surface plates, angles, and related products. Because these products are destined for layout operations, they must be made to precise tolerances. Mattison surface grinders have made it possible to maintain these tolerances along with cutting setup time in half, and increasing accuracy and production 50 per cent.

The part shown in the main illustration is a plane angle of Meehanite iron which must be ground to .0002 parallel in 60 in. removing .002 in. of stock on each pass. Finish required is 25 micro inch. This piece is difficult to grind because it is high and narrow and hard to hold on the table. The smooth operation of the Mattison grinder eliminates any possibility of vibration or tearing loose of the piece.

Every Mattison surface grinder features the high horsepower and sturdy construction that are needed for smooth and accurate operation on this type of work, as well as a wide range of other grinding. Send for catalog today

IF IT'S A FLAT SURFACE THERE IS A MATTISON TO GRIND IT



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

CASE HISTORY NO. 20—COMPRESSOR PARTS

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS

Two different cast iron compressor parts are ground from the rough, holding flatness and parallelism within .001 in.

Courtesy: Whirlpool Seeger Corporation

4800 surfaces rough and finish ground in 8 hours on Mattison 5-spindle Rotary Automatic

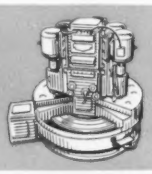
This Mattison No. 100 5-spindle Rotary Automatic finish grinds front and back surfaces of two different compressor parts at the rate of 2400 pieces every 8-hour shift. Parts are held in special fixtures and processed from the rough by five high-powered grinding heads, holding flatness and parallelism within .001 in.

Machining of 4800 individual surfaces per 8-hour shift is a production increase of 3600 over the former rate on a single-spindle machine. One side of both parts is finished in *one pass* through the machine. The parts are turned over, and the opposite sides are finished on the second pass. Stock removal is .077 in. per side. Wheels are set so a total of .065 in. is removed by the first three wheels. The last two remove .007 and .005 in. for finishing. Automatic sizers compensate for wheel wear, keeping parts within prescribed tolerances and eliminating frequent checking.

On long run jobs, Mattison Rotary Automatics are an advanced, high-production method for machining flat surfaces. Write for *new* Bulletin No. 147-2.

Continuous single-pass grinding on the rotary automatic produces more parts, more accurately, at the lowest possible cost.

MATTISON MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

4 ANOTHER *American* FIRST

operations on 720 connecting rods per hour

1 ASSEMBLE WRIST PIN BUSHING

2 BURNISH BUSHING I. D.

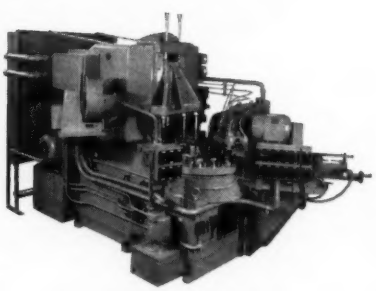
3 SPOT DRILL 1/8" OIL HOLE

4 FINISH DRILL OIL HOLE

Equipped with six, two-station locating fixtures, mounted on a rotating index base, this American machine does four operations at the rate of 720 pieces per hour (approximate at 100% efficiency).

At the first station, bushings are pressed into the wrist pin holes of the automotive connecting rods. At the next station, two American HSS burnishing tools burnish the holes and seat the bushings. The base then indexes the parts into position for two consecutive, horizontal drilling units. The first moves in to spot drill an oil hole and the second unit finish drills the hole through one wall. Operator unloads and reloads two parts at a time at the leading station.

American engineering can help you devise new and better ways to machine assemble parts — to combine operations and cut production costs. You can enlist American's long experience in this type of machine building by 'phone — or writing us details of your requirements. Why not do it today?



Note hopper feed and fully automatic push-button control.

Write for this new manual of broaching and machine assembly. Ask for Catalog 450.

AMERICAN *American* BROACH & MACHINE CO.

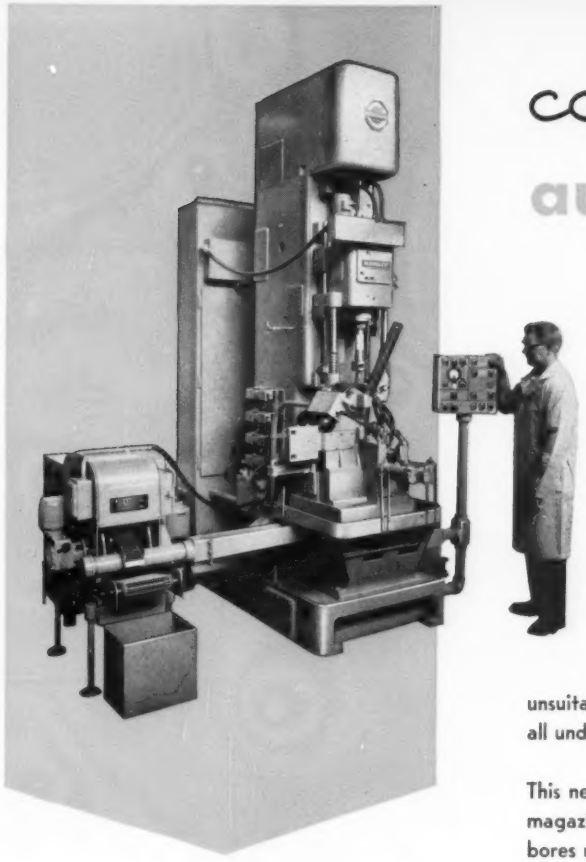
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

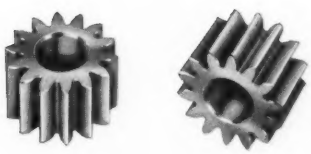
American Building - Ann Arbor, Michigan

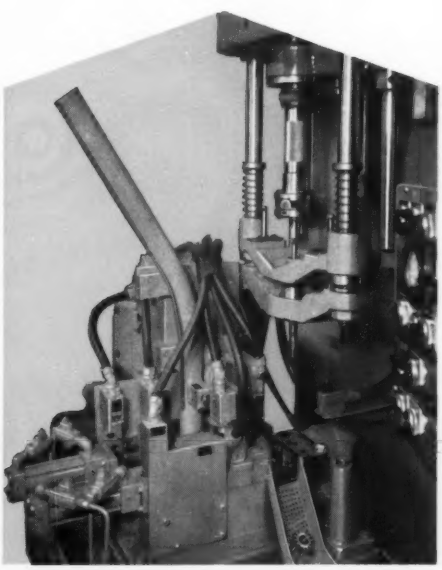
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**







completely automatic honing!

This BARNESDRIL Honing Machine Specially Designed for Continuous Operation with Magazine-Load and Automatic Ejection of Finished Parts.

BarnesdriL engineers have now established bore-finishing operations on a continuous and automatic basis — complete with automatic bore-to-bore sizing, automatic rejection of unsuitable parts, and automatic ejection of finished pieces. — all under Precision control at high production rates.

This new No. 223 BarnesdriL Honing Machine is designed with magazine-feed for loading. It automatically rejects oversize bores unsuited for honing and advances gear to honing position. It hones and sizes to preselected tolerances and finish, and then discharges finished and sized part.

All of these steps are under control of the automatic timed-cycle which successively removes stock, finishes and guarantees precision bore-to-bore sizing. Electronic hone expansion keeps the honing operation always at peak efficiency and automatically compensates for stone wear. Quick-loading type honing stones provide cutting support right up to the cutting edge, for long life and free cutting action.

Performance results in 180 hard steel gears honed per hour at 80% efficiency. Plugmatic sizing holds bore within .0005", and .001"/0015" stock is removed to a finish of 10 RMS.

Why not automate your bore finishing operations in a similar fashion and take advantage of reduced finishing costs through automatic high production and precision control.

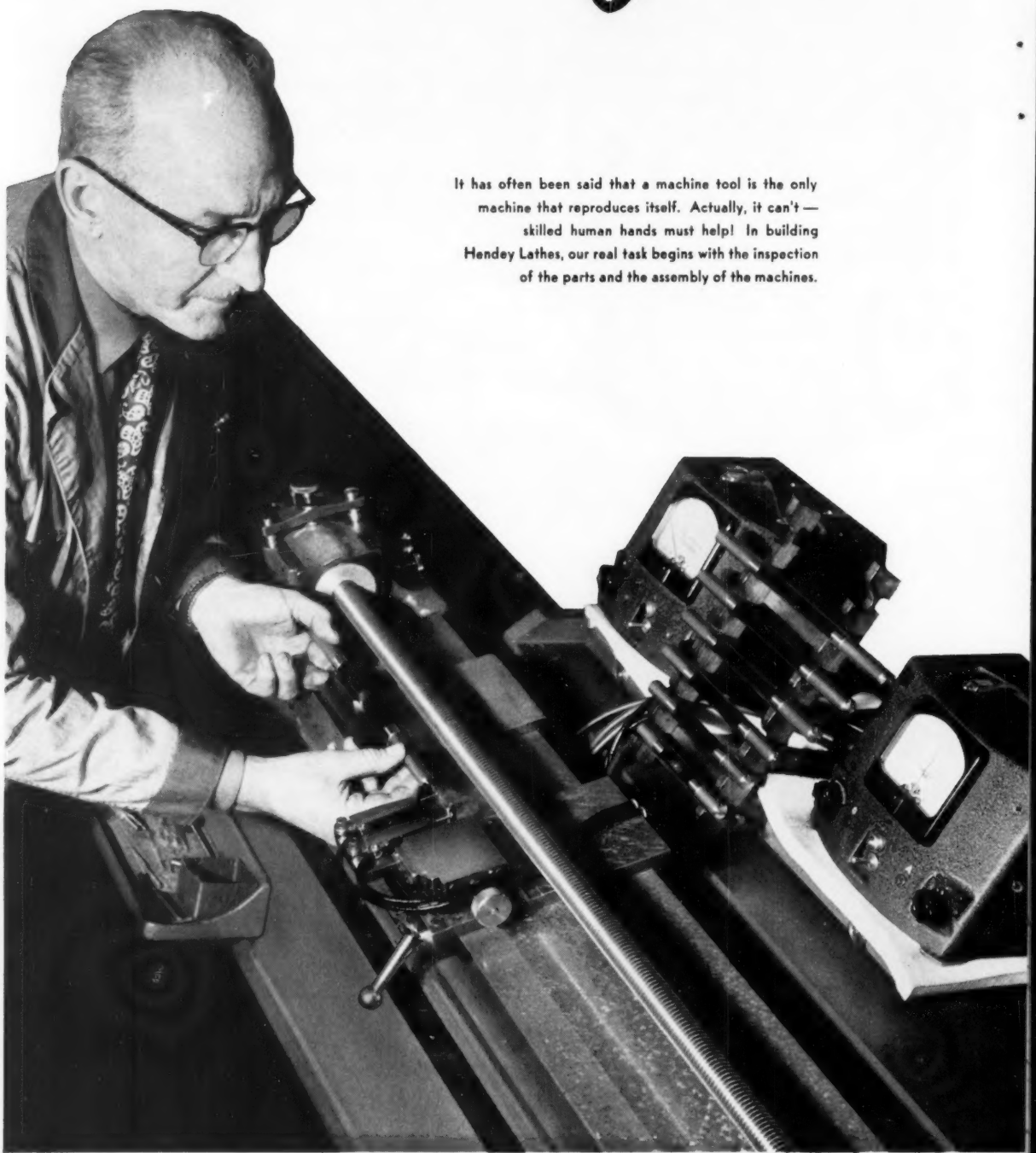
Call a Barnesdril engineer, or send us blueprints for production estimates.

BARNES DRILL CO.

820 Chestnut Street • Rockford, Illinois

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

Something more



It has often been said that a machine tool is the only machine that reproduces itself. Actually, it can't — skilled human hands must help! In building Hendey Lathes, our real task begins with the inspection of the parts and the assembly of the machines.

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

than tolerances...

creates the enduring accuracy built into

every *Hendey* Lathe!

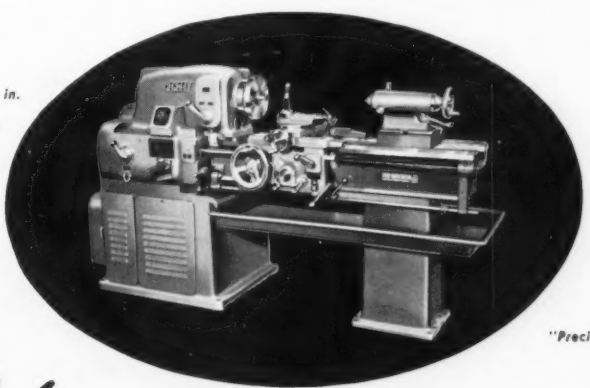
At the left you see one of our inspectors carefully checking a Hendey lead screw, assuring that it is within the prescribed tolerances. Every lead screw is cut to closest possible tolerances, and inspected with an electronic lead checker.

Every inch of every lead screw is checked with measuring rods and the special device shown. Two electronic gauges are used in this inspection — one to measure errors to within .0001 in., and the other to assure the operator that his setup remains the same from test to test. This method of inspection, re-enforced by the operator's desire for perfection, insures that lead screws are well within the lead tolerance over their entire length.

Our Model 2E General Purpose Lathe offers a fast, accurate method for cutting threads, as well as performing a variety of other toolroom operations. With a single, three-position lever on the apron, you can control the sequence of operations in thread cutting — starting, stopping, and reversing the tool through the thread without crossing it. For longer threads, half nuts and the thread chasing dial can be used.

For other operations, the Model 2E Electronic Drive gives you infinitely variable spindle speeds from 15 to 1500 rpm. On facing cuts, stepped diameters, and tapers, the operator can change speeds during the cut, selecting the correct rpm on the control rheostat. The belt drive provides smooth vibration-free power to the spindle for extra-fine finishes, and back gears are provided for heavier cuts. These and other Hendey features mean easier, low-cost production and faster "pay-off" on your investment. Write your Hendey dealer for complete facts!

Hendey No. 2E 14 in. General Purpose Lathe



"Precision with Production"

Hendey **machine division**

BARBER-COLMAN COMPANY

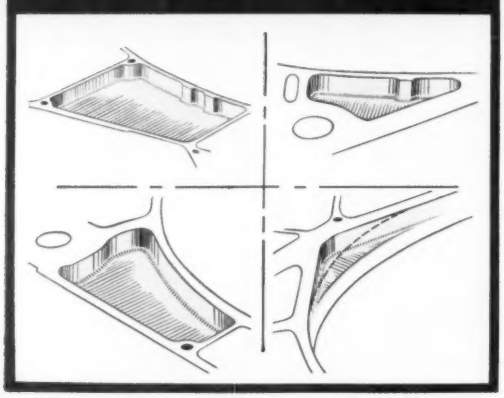
42 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN ®

FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

Typical Cuts

Illustrated below are only a few of the many detail cuts that can be taken on bulkheads, wing spars, caps, etc.

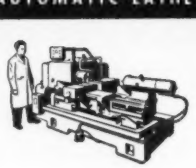


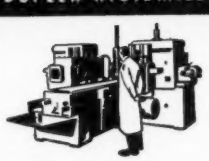
. . . SUNDSTRAND 3 DIMENSION TRACER MILLING UNIT

Here's a new milling unit designed for taking numerous small irregularly shaped cuts on large work pieces. The unit is self contained and can easily be moved to many different cutting positions around a large work part. If desired, several units can be mounted to a simple sub-base to provide a multi-station machine. As the cutter moves rather than the work piece itself, less floor

SUNDSTRAND "Engineered Production Service"* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

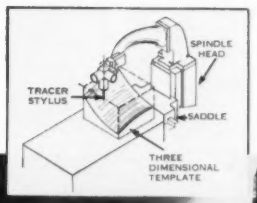


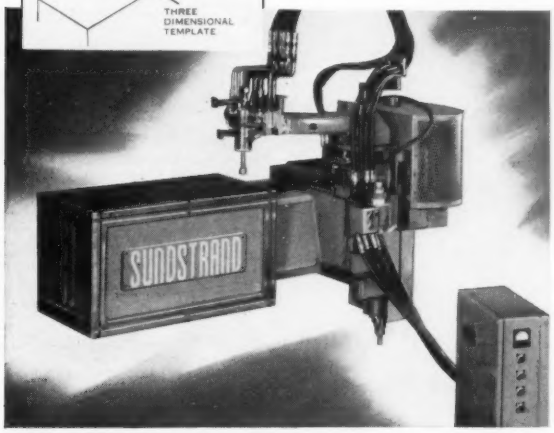


CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

space is required to do the work and greater accuracy can be maintained. Because the unit can be readily positioned, changes in product design can quickly be accommodated without obsoleting the basic equipment.

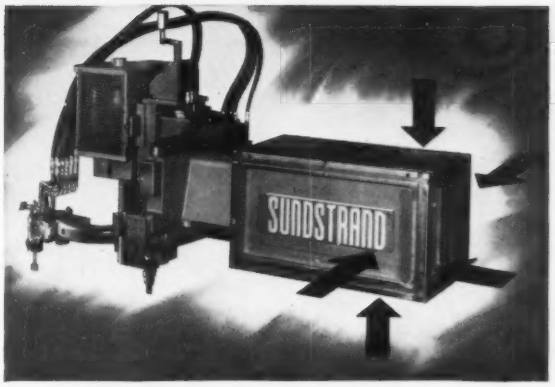
The ram support of the unit has transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end. The tracer stylus arm also has several manual mounting positions to further increase the possible uses of the unit.





Tracer unit showing application of template (in sketch).

The transverse and longitudinal movements of the cutter are 12 inches with a depth movement of 8 inches. All three movements are manually controlled from a single pencil type stylus tracing unit to enable duplication of the template on the work piece. Each movement has a quick shut-off valve for independent use of any one movement. The cutter head slide has a micrometer screw depth stop for accurate depth location for the full range of cutter travel. The linear and depth duplicating speed of the cutter is variable within a range of 1″ to 50″ per minute.



Tracer unit showing mounting provisions on all four sides and end.

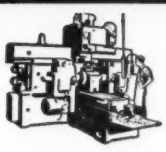
The stylus has a positive lock adjustment on all three movements to enable the locating of the cutter in relation to the stylus on the template. To allow for the changing of various size tracing stylus without changing the cutter, a quick change positive lock stylus chuck has been provided.

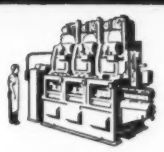
The unit shown has a belt driven 3 h.p. head with 4 possible speed changes of 200, 400, 900 and 1800 r.p.m. Also available is a 3 h.p. head with infinitely variable speeds between the range of 200 to 1800 r.p.m. In addition, 5 h.p. heads of either the 4 speed belt driven type or the infinitely variable speed type can be furnished.

Additional Data

covering this unit is available upon request. Write for this information today. Ask for Bulletin 666.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

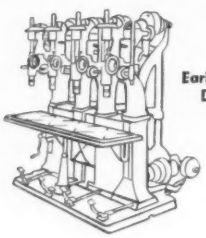
FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

W. F. & JOHN BARNES

1872-1956

FROM

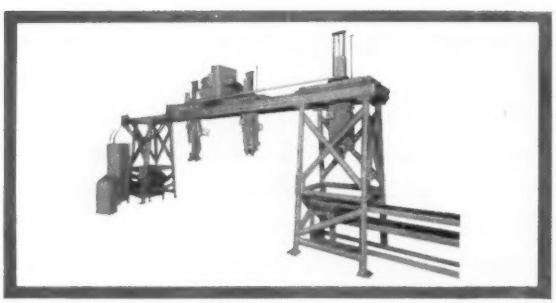
Foot Powered Scroll Saw

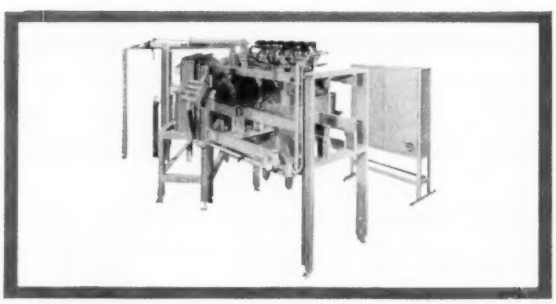


Early Gang Driller

It was back in 1872 when the ox cart was still used for transporting goods and Edison was still experimenting with the electric light, that W. F. & John Barnes built their first industrial machine — a Foot Powered Scroll Saw. Later in the 1880's, the first Gang Drilling Machine was designed and built. This forerunner of the modern machine tools of today was shipped by ox team to a customer in a nearby town. Three days later, the records say, it arrived at its destination — a distance of 40 miles.

It is also a matter of record that all through these years, from oxen to jets, machines bearing the W. F. & John Barnes' name have been consistently associated with progressive developments and improvements in manufacturing methods. As a result, when you specify a Barnes' built machine today, you get a creative engineering and building service that is seasoned by experience — one that is complete and geared to serve your needs better than ever before.





▲ **SPECIAL CONVEYORS** — typical of variety of units designed and built from standard components to increase material handling efficiency between machining operations. Engineered to meet individual job requirements.

▲ **SPECIAL AUTOMATION EQUIPMENT**—includes a range of turn mechanisms, (illustrated), special transfer and unloading equipment, inspection, and assembly machines, designed for automatic or semi-automatic production-line operations.

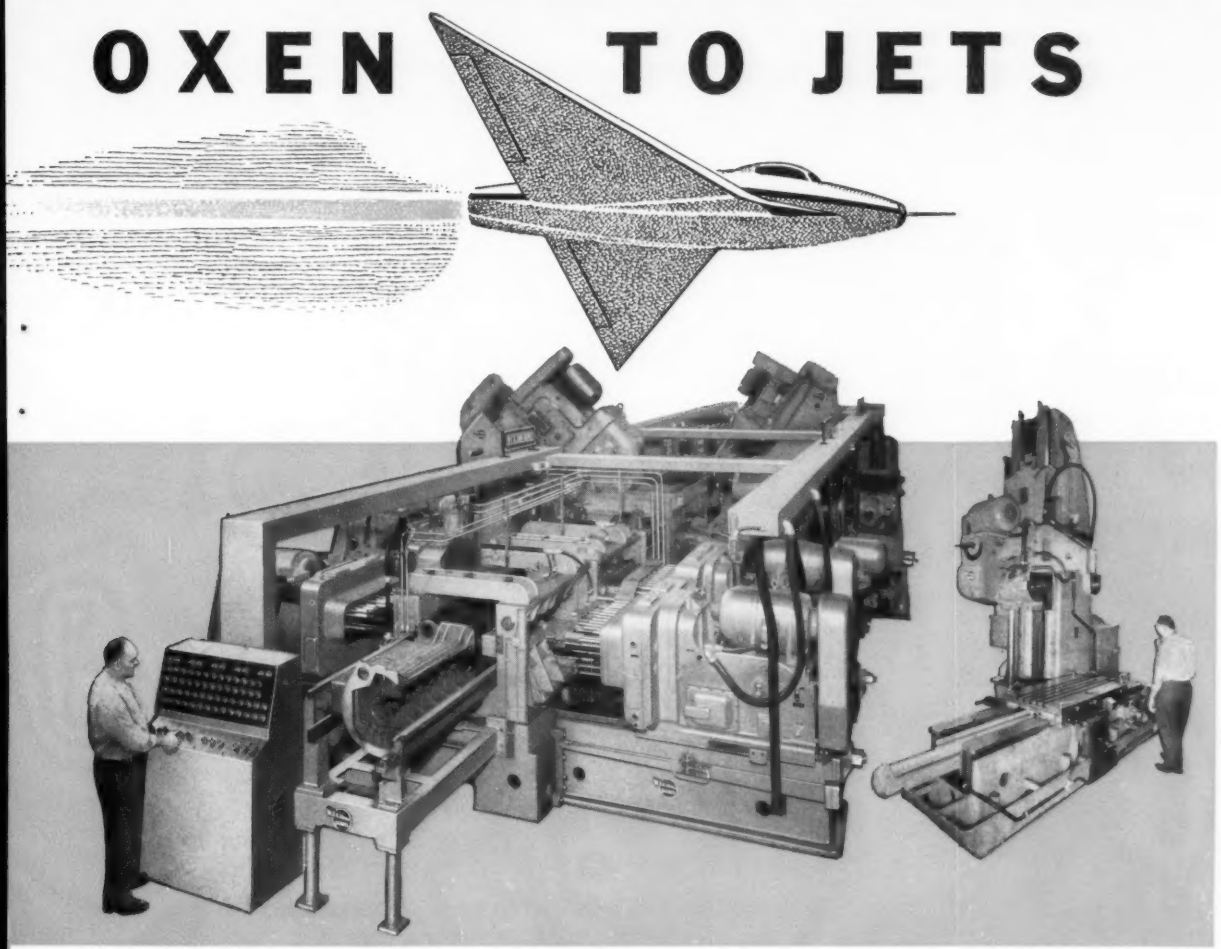
W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1872

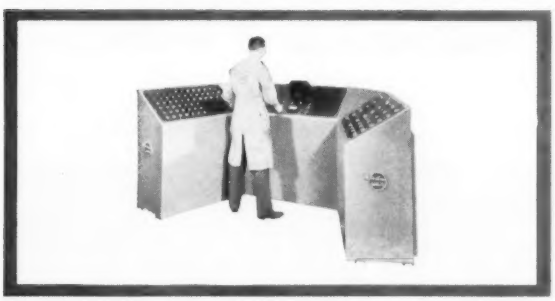
MULTIPLE SPINDLE DRILLING • BORING • TAPPING

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**

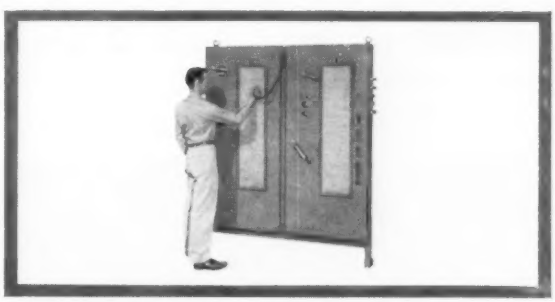
OXEN TO JETS



MODERN MACHINE TOOLS — units illustrated are typical of the large Progress-Thru and Single Station units designed and built by Barnes. 11-Station unit at left was designed to machine both 4 and 6-cylinder tractor engine blocks at 25 pieces per hour. Single-spindle machine at right slab and face mills motor frame mounting pads at 6½ pieces per hour.



SPECIAL ELECTRICAL CONTROLS — a typical Barnes unitized control system of the sequence type. All are designed to assure the most dependable service and are built to best serve your specific needs.



ELECTRO-GRAPHIC DETECTOR SYSTEMS — a new, exclusive Barnes development. Cuts maintenance time on complex electrical controls up to 90%. Wired-in checking system pin-points malfunctioning elements.

Write **FOR FREE LITERATURE** — New 8-page brochure illustrates and describes Barnes' expanded facilities . . . outlines 6-Point Coordinated Machine Tool Designing and Building Service.

W. F. & JOHN BARNES COMPANY • 402 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

FOR PRODUCTION MACHINE TOOLS IT'S ROCKFORD, ILLINOIS, U.S.A.

Duplication

Duplication

KOPY-KAT Duplication

is a direct hydraulic transfer with no intermediate motions

machining is completely automatic

there is no chance for irregularities or error in final work

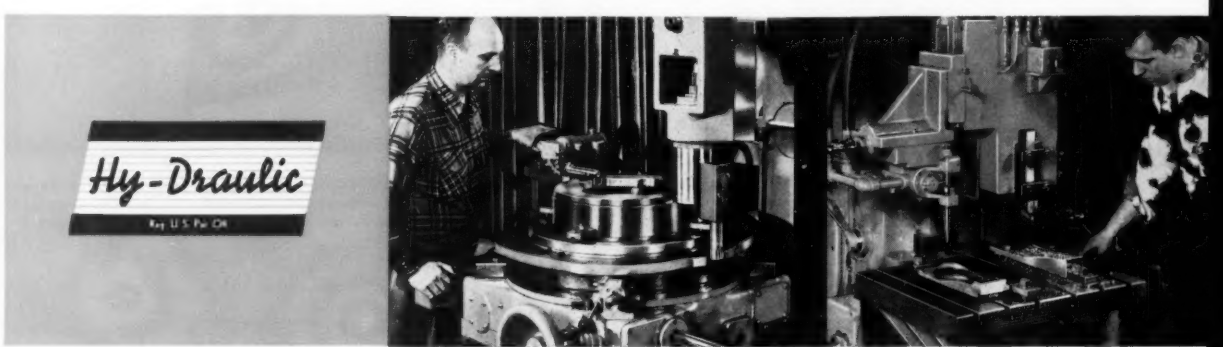
The KOPY-KAT is adaptable to an endless variety of duplicating jobs, from the simplest to the most complex. Manufactured specifically by Rockford Machine Tool Co. for use on new machines, it becomes an integral operating part of any hydraulic shaper, planer or slotter on which it is installed.

Investigate the KOPY-KAT which duplicates automatically with the ease of straight-production machining . . . and faithfully reproduces many forms previously considered impossible to machine.

Ask a Rockford Machine Tool Co. representative for further information . . . or write directly to us.

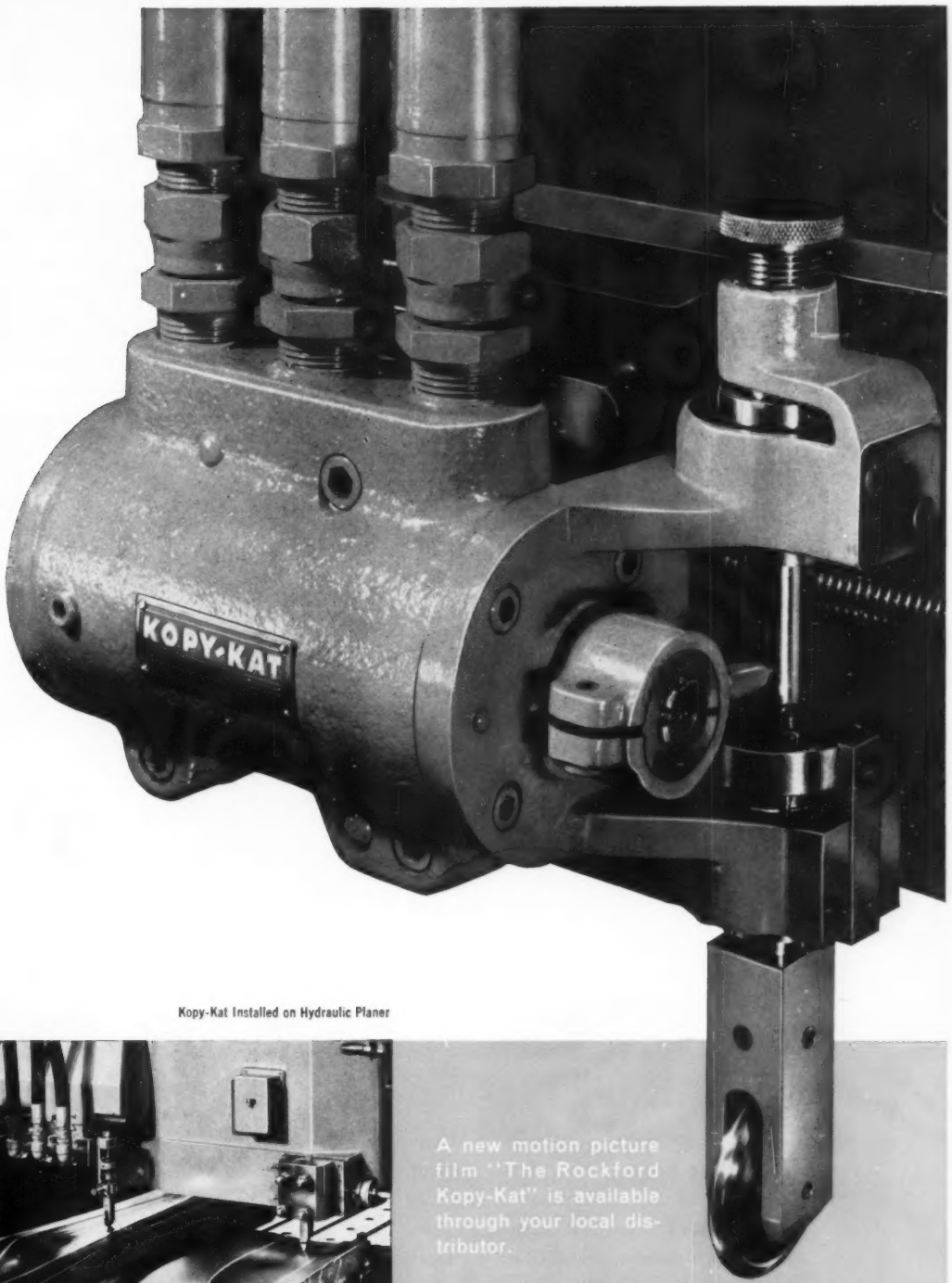
Kopy-Kat Installed on Hydraulic Slotter

Kopy-Kat Installed on Hydraulic Ram Shaper

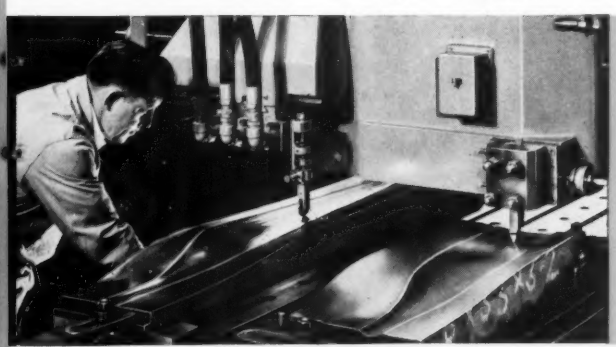


SHAPERS · PLANERS · SLOTTERS · SHAPER-PLANERS · LATHES

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**



Kopy-Kat Installed on Hydraulic Planer

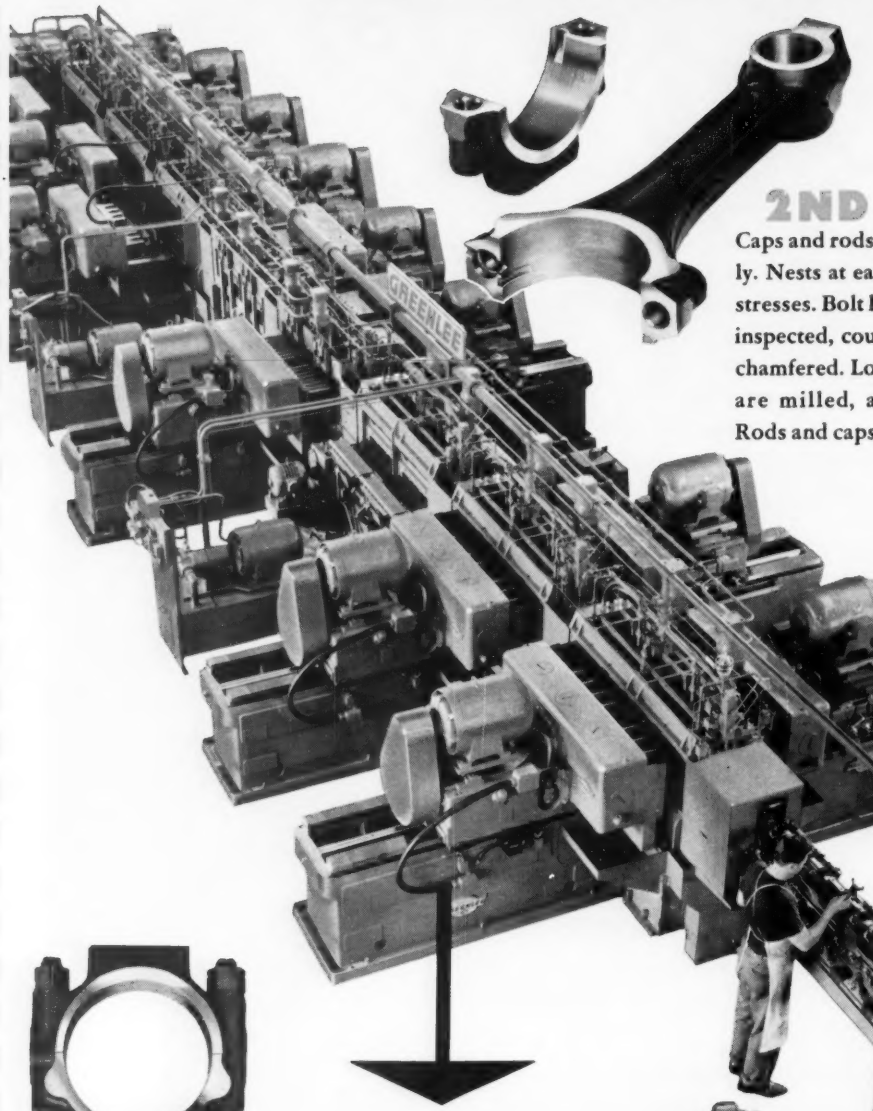


A new motion picture film "The Rockford Kopy-Kat" is available through your local distributor.

ROCKFORD MACHINE TOOL CO. ROCKFORD, ILLINOIS

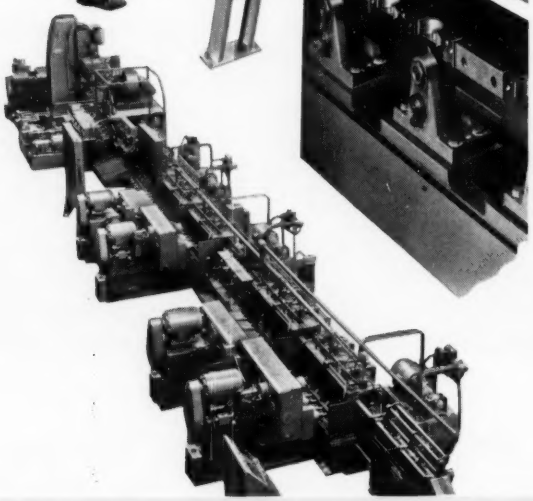
FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**

another first . . . GREENLEE



2ND MACHINE

Caps and rods are machined simultaneously. Nests at each station hold work, avoid stresses. Bolt holes are drilled, reamed and inspected, countersunk, counterbored and chamfered. Locating slots and oil grooves are milled, and oil holes are drilled. Rods and caps are discharged to conveyor.



3RD MACHINE

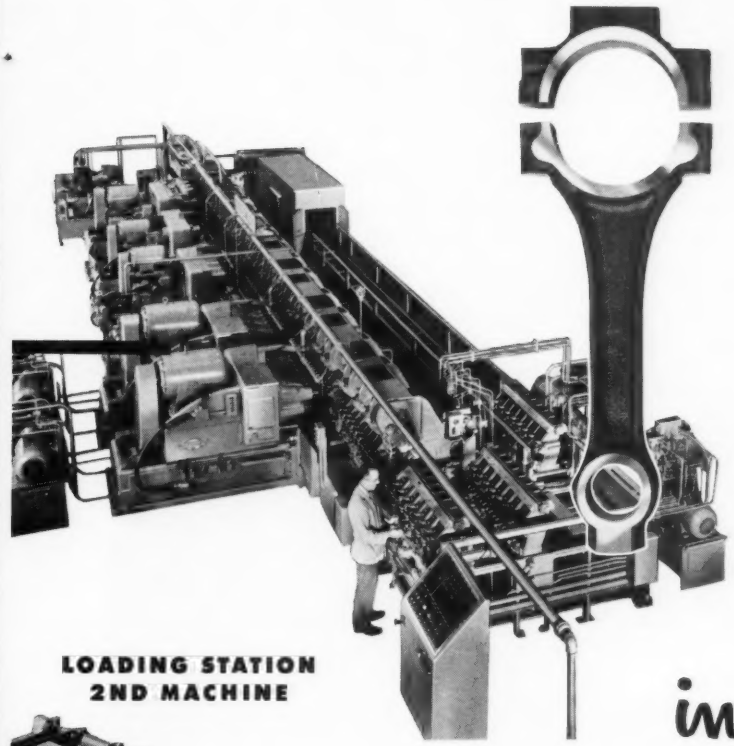
Mating surfaces have been ground, rod and cap assembled. Assembled rods are located and clamped in nests at each station. Crank holes are semi-finish bored, pin holes are finish reamed, both are chamfered. Rod is automatically gauged and accepted or rejected. Wrist pin bushing is assembled, burnished, chamfered at both ends. An oil hole is drilled through bushing, and rod is unloaded onto a conveyor.

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

CONNECTING-ROD TRANSFER MACHINES!

Greenlee Built Automation into Connecting Rod Production

result: **GREATER ACCURACY, LOWER COST AND INCREASED PRODUCTION**

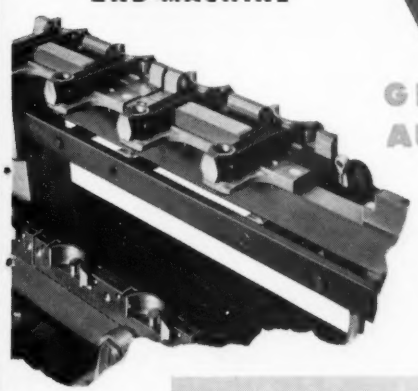


1ST MACHINE

Single-piece rough forgings, with bosses finished, are pallet loaded. Clamping in nests avoids stresses. Crank holes are elliptical bored, pin holes drilled and reamed, caps cut off, caps and rods automatically unloaded onto a conveyor.

Send for Bulletin No. 457

LOADING STATION 2ND MACHINE



investigate

GREENLEE CREATIVE THINKING . . . AUTOMATION EXPERIENCE . . . ENGINEERING

See how Greenlee can help you avoid production bottlenecks in proposed new facilities . . . overcome existing production problems . . . reduce production costs . . . and help you attain a better, stronger, more competitive position in your industry.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1865 MASON AVENUE
ROCKFORD, ILLINOIS

CITY OF MACHINE-TOOL SPECIALISTS **ROCKFORD, ILLINOIS, U.S.A.**

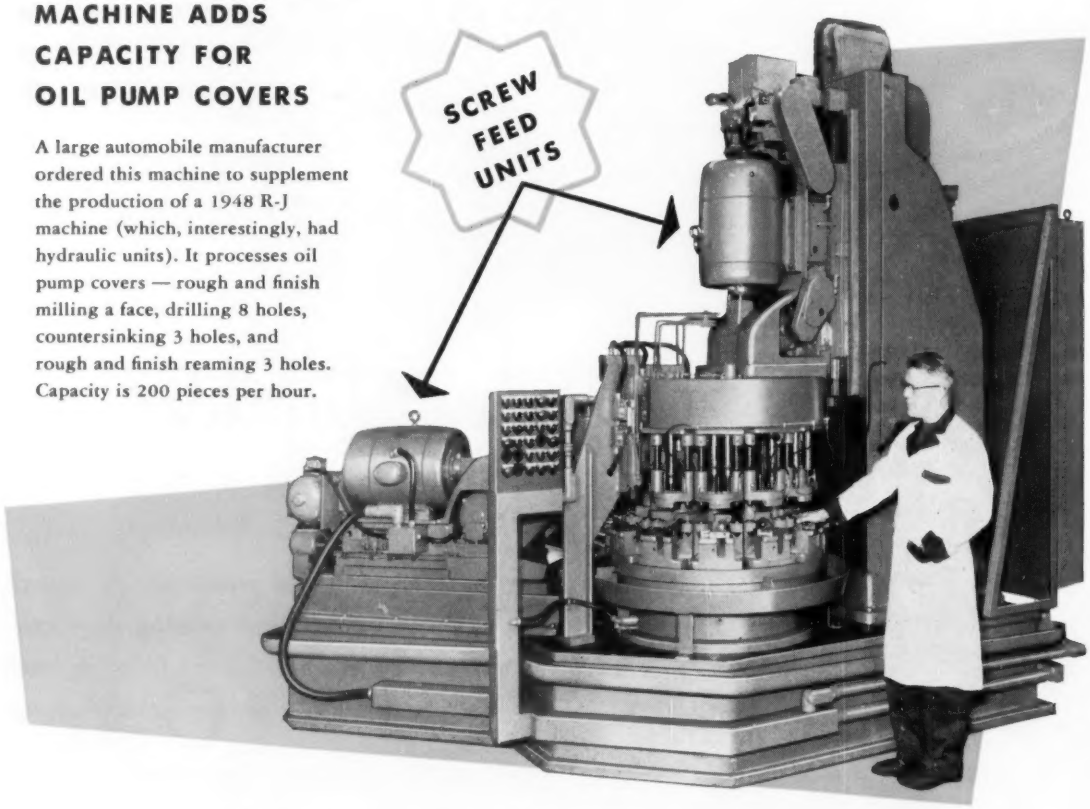
REHNBERG-JACOBSON

SCREW-FEED UNITS PROVE WORTH; "SPECIFIED" ON NEW MACHINE...

Rehnberg-Jacobson ALL-MECHANICAL Screw-Feed Power Units were carefully investigated by the potential purchasers of this machine — with the result that they *insisted* the Units be included. These Units later proved to be important factors in the final (and favorable) consideration. In many other instances, R-J Screw-Feed Units have shown that they are rugged, reliable, and — most important — *easily understood* by service and maintenance people. These Units operate on the well-proved feed screw principle, with separate motors driving differential nuts to obtain the desired approach, feed, dwell, and rapid return. An accurate and fast-acting brake is included to insure precise ending of the fast return. As can be seen from the picture, the Unit frame is large enough to carry a husky spindle-drive motor, and the face plate will hold a large multiple-spindle head. *For full details and specifications, write for literature.*

MACHINE ADDS CAPACITY FOR OIL PUMP COVERS

A large automobile manufacturer ordered this machine to supplement the production of a 1948 R-J machine (which, interestingly, had hydraulic units). It processes oil pump covers — rough and finish milling a face, drilling 8 holes, countersinking 3 holes, and rough and finish reaming 3 holes. Capacity is 200 pieces per hour.



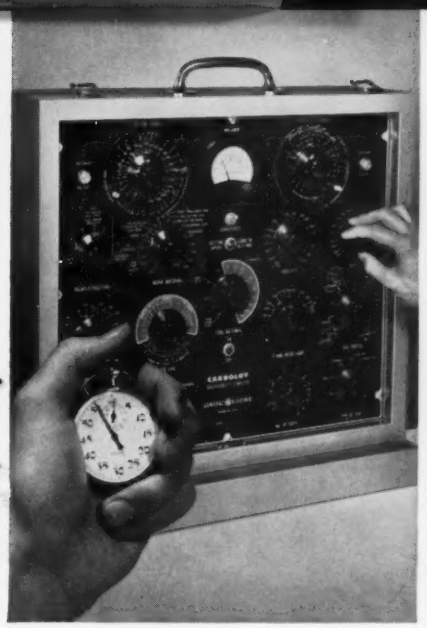
Designers and Builders of Special Machinery

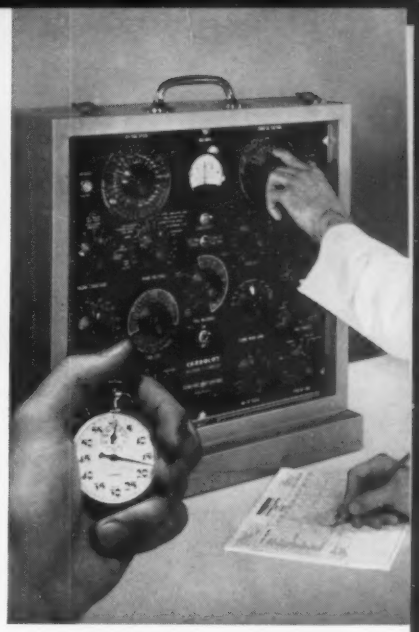
REHNBERG-JACOBSON MANUFACTURING COMPANY

2135 KISHWAUKEE ST.

ROCKFORD, ILLINOIS

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**





Set dials for the values of each of the known variables. (Time: 1-2 minutes.)

Turn dial of unknown variable until meter balances at zero setting. (Time: 10-15 secs.)

Read the answer directly off the dial. No computations are necessary. (Time: 10 secs.)

SOLVE MACHINING PROBLEMS IN SECONDS WITH CARBOLOY MACHINABILITY COMPUTER

- **Calculate production, tool life, horsepower, or any of 16 other basic machining variables**
- **Eliminate wasteful tryout runs, improve existing setups**

The Carboloy® Machinability Computer is a new engineering tool designed to solve complex machine setup problems in seconds, instead of hours.

It calculates the effect of the 19 most critical machining variables on the material to be cut, the cutting tool, and the cutting conditions . . . shows how to set up optimum operating conditions for any metal-cutting job, and how to improve existing setups by the right variation of operating conditions.

For production men, methods men, etc.

The Computer assists production men by determining rate of metal removal, and by immediately showing how production is affected by changes in feed, speed, depth of cut, tool material, and other key variables.

It will eliminate wasteful, nonproductive trial runs, saving valuable stock and setup time. It also determines machine output for methods men, pieces per hour for estimators, and it answers other problems pertaining to machining . . . providing accurate solutions in seconds for problems that normally take hours.

Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

The computer is portable (weighs only 32 lbs.), battery-operated, and measures 21″ x 7″ x 20″. Price: $495, f.o.b. factory, Detroit.

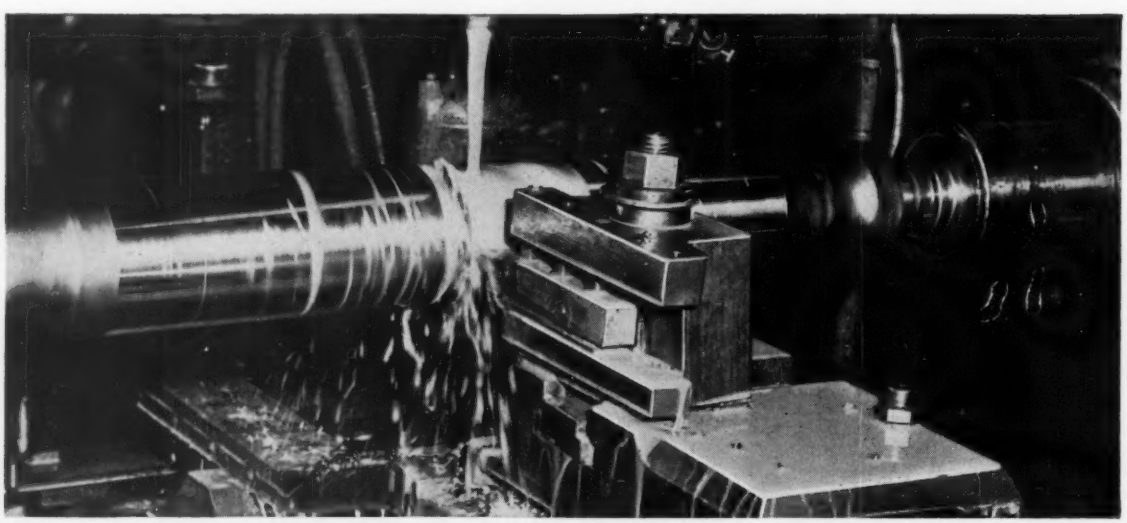
Whether your plant is large or small, the Carboloy Machinability Computer can pay for itself by increasing production, reducing manpower costs. Send the coupon on page 4 of this advertisement for full details. We will arrange a demonstration in your plant.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

TURNING AND FACING TURBINE WHEEL HUBS. Before Grade 370, a 12-inch Fay Automatic (pictured on opposite page) required more than five minutes to drill, turn, and face the rough Inconel X forging (shown at top, left) . . . and the machine was shut down half the time because tools required constant regrinding. Here are the results after Kelsey-Hayes Wheel Company switched to Carboloy Grade 370: machining time per piece cut 40%; production and tool life almost doubled; downtime drastically reduced; finish improved (shown at bottom, right).

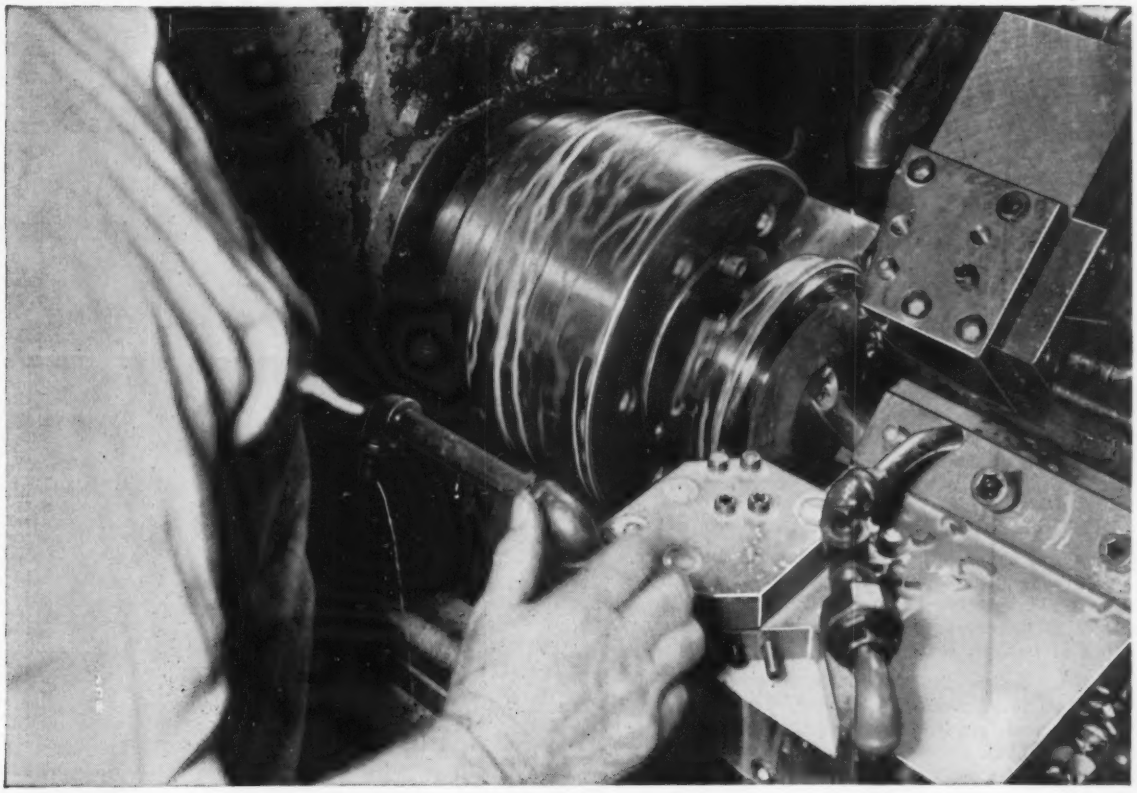
SETUP: Material – Rough Inconel X forging. **Speed** – 100 sfpm. **Feed** – 0.144 inch. **Depth of cut**–3/16 inch. **Coolant**–Yes.

CUT MORE STEEL PER MINUTE WITH CARBOLOY



TURNING LANDING-GEAR PISTON. With regular carbides, Menasco Mfg. Co. was getting only one part per tool grind, with the job running at 170 sfpm. With Grade 350, speed was stepped up to 227 sfpm, tool life increased 6 to 1, and machine downtime decreased.

SETUP: Material – 4340 forged steel, heat-treated to 46 Rockwell "C." **Speed** – 227 sfpm. **Feed** – 0.010 inch. **Depth of cut** – 0.060-0.200 inch. **Coolant** – Yes.



EXTRA-PERFORMANCE GRADES 350 AND 370

- **Take heavier, deeper cuts without tip deformation**
- **Increase production up to 300% over other carbides**

Machining records in plant after plant show Carboloy Grades 350 and 370 consistently outperform conventional carbides . . . and far outwear them on the toughest jobs.

These grades cut more steel per minute, give more production per tool, increase machine efficiency. They outwear all other steel-cutting carbides, with less downtime for tool changes, and lower cost per piece.

Built-in structural rigidity

Carboloy Grades 350 and 370 are extra-performance carbides. Their superiority is due to the greater structural rigidity built-in by the Carboloy manufacturing process.

This process enables them to take deep, punishing cuts without the chipping, cracking, or cratering encountered in other carbides . . . even at temperatures as high as 1800° F.

No "equivalent grades"

Try heavy-duty Grade 370 and medium-duty Grade 350 . . . compare them with ordinary carbides on the toughest jobs. See why there are no "equivalent grades" to Carboloy 350 and 370.

Authorized Carboloy Distributors stock a complete line of Grade 350 and 370 tools, blanks, and inserts. Call them today; or for more information on these extra-performance carbides, send the coupon on page 4 of this advertisement.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

For more information fill in page number on Inquiry Card, on page 257

CUT INDEXING TIME AND INSERT COSTS WITH EASIER-TO-USE CARBOLOY TOOLHOLDERS

- **Single screw indexes insert; automatically sets chipbreaker**
- **Carbide pad absorbs shocks; cuts throw-away insert costs**
- **New design reduces overhang; improves tool accuracy**

By simply adjusting a single screw at the top of the shank, the blank can be indexed while the Carboloy holder stays in the machine. The carbide chipbreaker is set automatically in the correct position.

Carbide pad cuts insert costs

Because the carbide pad absorbs shocks and gives greater rigidity, thinner, harder, more economical cutting blanks can be used. Machines operate at greater speeds and feeds; increase output at reduced cost.

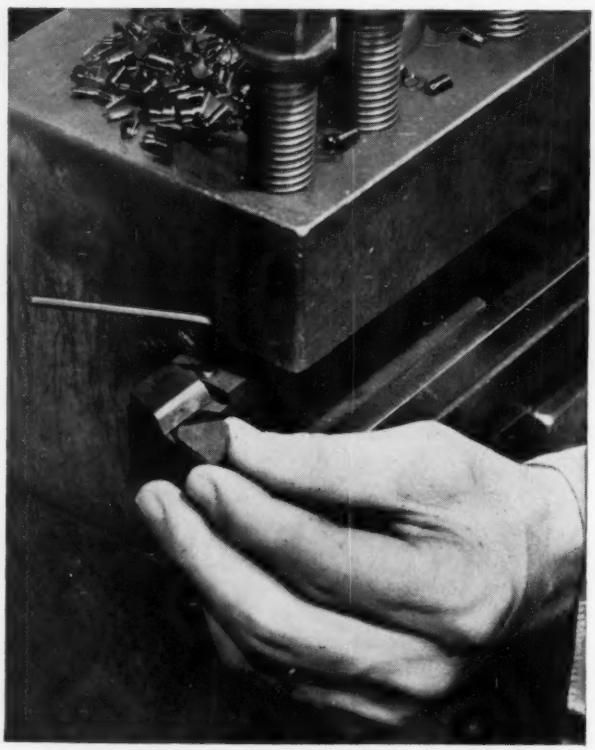
Carboloy design eliminates projections below the shank . . . reduces overhang, increases accuracy and rigidity. Minimum projection above the shank stops chip interference, protects clamp from abrasive chips.

Heat-treated shanks give the holders extra strength to resist deformation and chip wear.

Handle special jobs with ease

The Carboloy holder design is quickly adaptable to "specials" with cutting angles other than standard, and to positive or neutral rakes. New, compact design makes them especially efficient for gang tooling.

Available for round, square, or triangular blanks, the Carboloy holders are stocked in 7 styles and 52 sizes. New, heavy-duty holders are also available. For prices and specifications, send the coupon today.



New Carboloy Toolholders can be indexed quickly and easily . . . right in the machine. Chipbreaker is set automatically.

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11147 E. 8 Mile Street, Detroit 32, Michigan

Send me information on these Carboloy products:

- ☐ Carboloy Machinability Computer
- ☐ Grades 350 and 370 steel-cutting carbides
- ☐ Carboloy Toolholders

Also:

- ☐ Have a representative make an appointment to demonstrate the computer
- ☐ Send the name of the nearest Authorized Carboloy Distributor

Name_____

Title_____

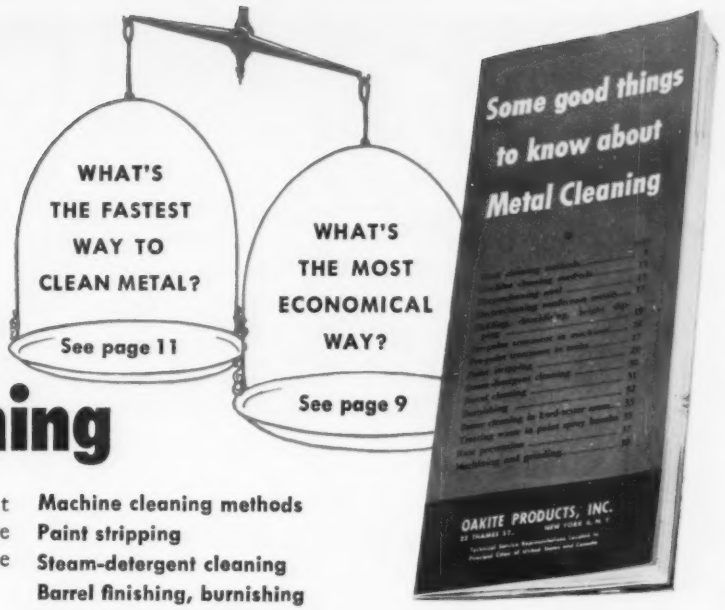
Company_____

Address_____

City_____ Zone____ State_____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

Oakite's FREE Booklet on Metal Cleaning


WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning
OAKITE PRODUCTS, INC.

answers many questions that mean better production, more profit for you. Just look at the table of contents:

Tank cleaning methods
Electrocleaning steel
Electrocleaning nonferrous metals
Pickling, deoxidizing, bright dipping
Applying iron phosphate coatings in preparation for painting
Applying zinc phosphate coatings
Cleaning, removing rust and conditioning for painting in one operation
Machine cleaning methods
Paint stripping
Steam-detergent cleaning
Barrel finishing, burnishing
Better cleaning in hard water areas
Treating wash water in paint spray booths
Rust prevention
Coolants and lubricants for machining and grinding

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SPECIALIZED INDUSTRIAL CLEANING
OAKITE®
MATERIALS · METHODS · SERVICE
SCIENCE

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE PRODUCTS, INC.
26 Rector St., New York 6, N. Y.

Send me, without obligation, a copy of your booklet: "*Some good things to know about Metal Cleaning*"

NAME _____

COMPANY _____

ADDRESS _____

You'll want to know the answers

Can one cleaning material do all metal-cleaning jobs? *See page* 5.

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? *See page 8.*

Why clean ferrous and nonferrous metals in separate tanks? *See page* 10.

What are the advantages of reverse current for electrocleaning steel? *See page 15.*

For electrocleaning nonferrous metals, what are relative advantages of cathodic, cathodic-anodic and soak-anodic cleaning? *See page* 17.

Can you electroclean brass without tarnishing? *See page 18.*

How do bright dips make metals brighter? *See page* 21.

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? *See page 24.*

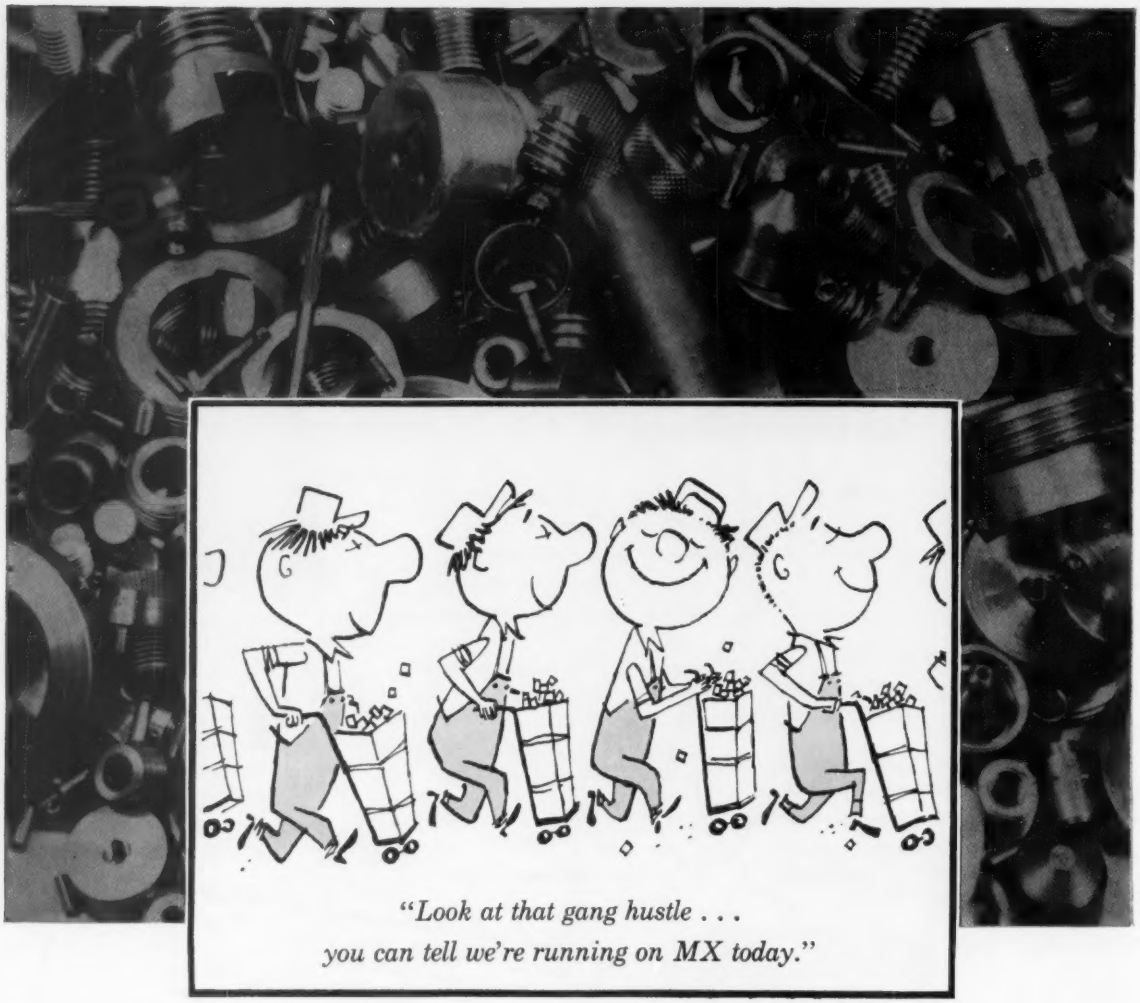
Would you like a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page* 28.

What's the best way to clean parts that are too large to be soaked in tanks or conveyed through washing machines? *See page 30.*

Does your burnishing barrel produce a luster you are proud of? *See page* 32.

What do you do when the overspray neither sinks nor floats in the wash water in your paint spray booth? *See page 35.*

Do you dry steel parts before anti-rusting? *See page* 37.



"Look at that gang hustle . . .
you can tell we're running on MX today."

You can confidently count on bigger output—more parts per hour—when you put USS Free-machining MX Steel to work.

By making it possible to run at cutting speeds up to 50% higher than normally used with regular Bessemer grades, MX has boosted production in hundreds of shops from 10 to 50%—an average of 40%. And with this easier machining steel, tools have lasted up to 200% longer.

USS Free-machining MX has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today . . . yet it costs no more than ordinary screw stock.

Based on the results obtained in producing more than a billion parts of many different kinds and under different conditions, we feel sure that MX will cut the cost of any part you now machine from ordinary screw stock. It does this in four ways.

By increasing the rate of production, *MX lowers the cost per part.* By prolonging tool life, *MX reduces down time.* By assuring better part finish, *MX often eliminates extra finishing operations.* By providing closer dimensional accuracy, *MX helps to minimize rejects.*

Available in both Bessemer and Open-Hearth grades, USS Free-machining MX is produced in all the popular screw stock sizes. It is sold in cold finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our district sales offices.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

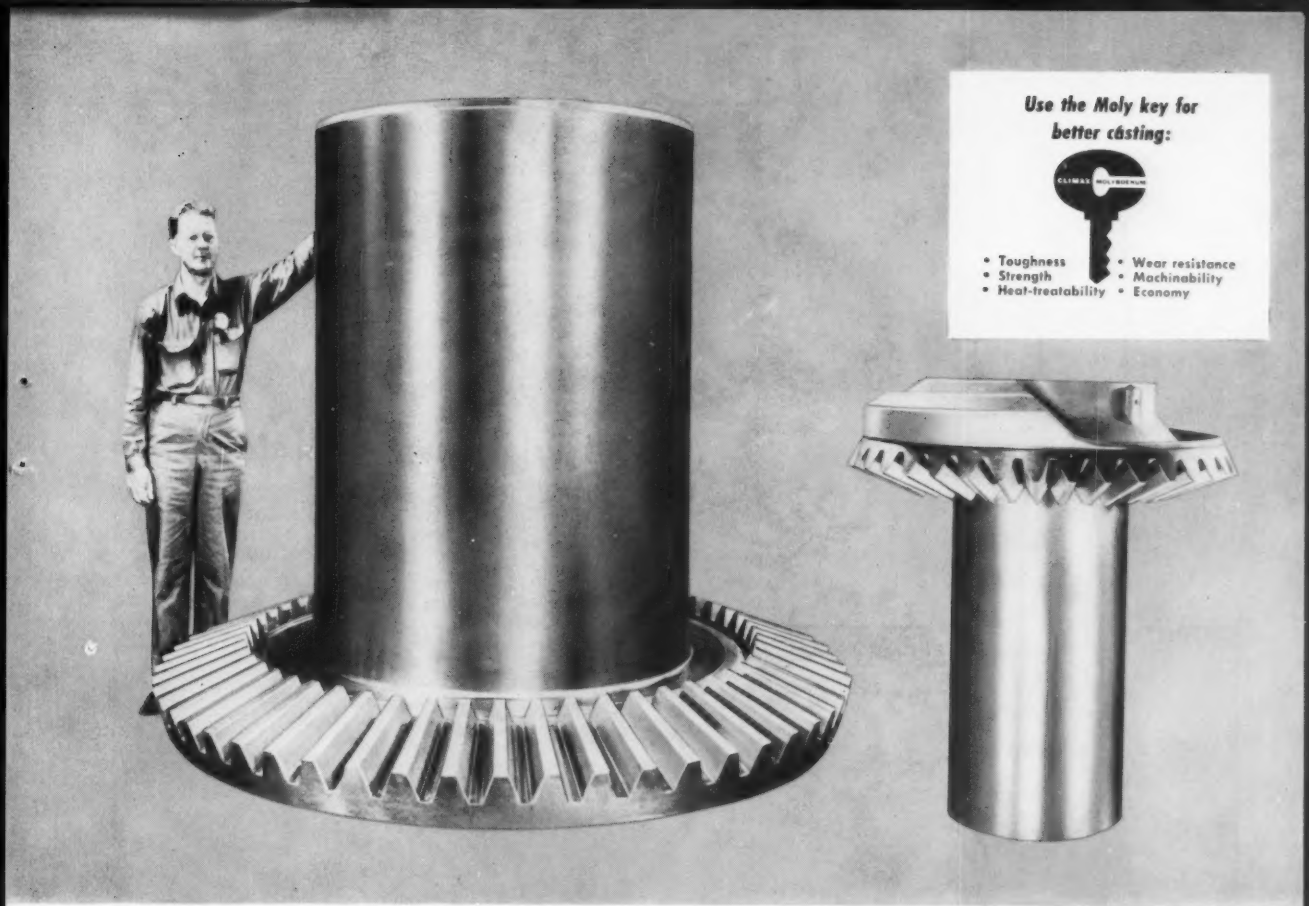
Longer tool life . . . bigger output . . . lower costs

***—when you do the job with free-machining* MX**

USS

UNITED STATES STEEL

For more information fill in page number on Inquiry Card, on page 257

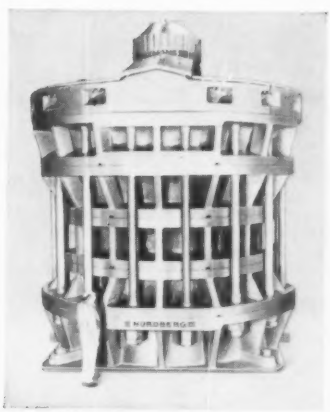


Heavy duty ore crushing machinery is subjected to severe operating conditions. To meet these strenuous requirements the gears shown are made from heat treated low-alloy manganese-*Molybdenum* steel castings. At left: a Symons Gyratory Crusher gear; right: a Symons Cone Crusher gear. Built by Nordberg Mfg. Co.

Cast Manganese Moly Steel contributes strength and toughness to Crushers built by Nordberg

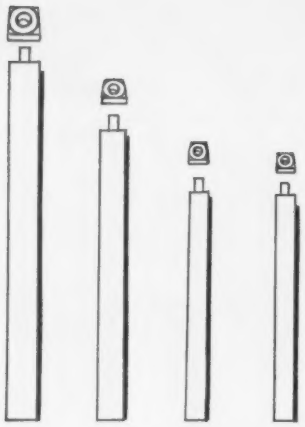
"Where high strength and toughness are prime considerations," says Howard Zoerb, Consulting Engineer of the Nordberg Crusher Division, "molybdenum bearing steels are specified. This is true of the heavy duty parts of Symons® Crushers, built by Nordberg. These steels have contributed to the Nordberg reputation as producers of dependable, heavy duty crushing machinery."

Technical assistance is available to foundries on alloying problems. Please address inquiries on your foundry letterhead to: Climax Molybdenum Company, Department MF 13, 500 Fifth Avenue, New York 36, New York.

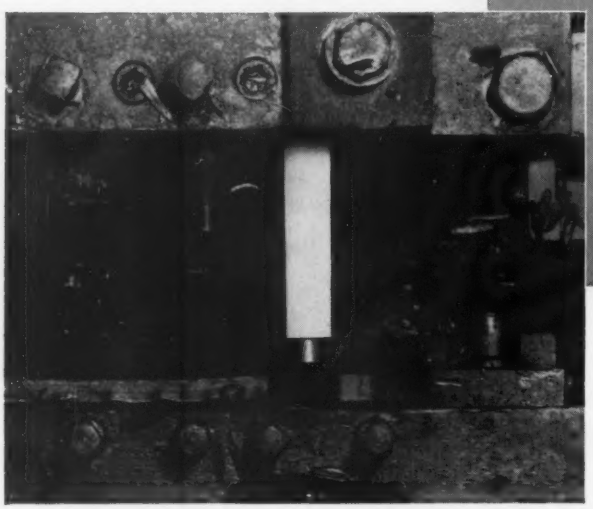


The Symons Cone Crusher is a product of Nordberg Manufacturing Company.

CLIMAX MOLYBDENUM



A-L CUSTOMER FINDS SAGAMORE PUNCHES BEST IN TOOL-COST STUDY



Looking down on the SAGAMORE high speed cold nut punch in horizontal press.

An A-L customer tested various tool steels to determine the best for his varied cold-punching operations. New, air-hardening, non-deforming Ludlum Sagamore Die Steel was the ultimate choice. Here's why:

- The use of SAGAMORE cold-drawn stock eliminated the need for finish-grinding of the punches.
- Punches of SAGAMORE outperformed those of carbon-vanadium steel three to one.

The SAGAMORE punches were hardened by heating in a salt bath to 1750F. and air cooled. They were then given a double draw at 1110F. The resulting Rockwell hardness was 51C.

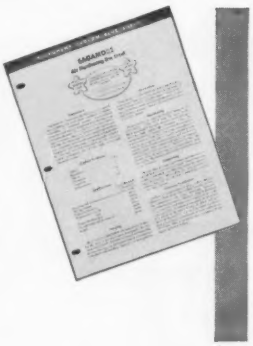
Characteristics of Ludlum SAGAMORE are: Excellent non-deforming properties, unusual toughness, lower hardening temperatures, and easier machining and grinding. These, plus the comparatively low cost, make it a good selection for this type of application.

For assistance with your tool or die steel problems, call your local A-L representative or distributor today, or write ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.***

Write for your SAGAMORE BLUE SHEET

This four page report was compiled from data collected in laboratory and field tests. Included is complete information on applications, physical characteristics, forging, annealing, hardening, tempering, etc. *Ask for your copy.*

Address Dept. M-76



For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 5328

AL® FINE TOOL STEELS SINCE 1854

right in tune

...and REX is the standard by which all other high speed steels are compared

A tuning fork sounds the *standard pitch* to which musical instruments are compared. There's a recognized standard for high speed steels, too – Crucible REX®.

But don't take our word for it. Try REX in your own shop. Compare its structure, finish, hardenability, carbide distribution and general uniformity. Measure the *extra performance* you get. You'll see for yourself why no other tool steel outperforms REX . . . why it's the *standard for comparison* wherever high speed steels are used.

Next time you buy tool steels, be sure of top performance – specify REX. Remember, it's made only by Crucible – and is available from local warehouse stocks, or by prompt mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information fill in page number on Inquiry Card, on page 257

Three Forgings That Support the Globe

In Greek mythology, Atlas was charged with the job of holding up the heavens, but right here in our own day and age is a "world" supported by forgings. It is a huge and wondrous globe that stands on the campus of Babson Institute of Business Administration, Wellesley, Mass. Its size may be judged by the people standing beneath it in the picture.

The vividly colorful globe is built to a scale of 1 inch to 24 miles. It can revolve to simulate the daily rotation of the earth on its axis. It also moves around a circular track to demonstrate the earth's orbit.

Holding the globe at its proper "tilt" is a six-ton assembly consisting of shaft, socket, and lower bearing support. All these components are forgings made and finish-machined by Bethlehem. The mounting and carriage are also products of Bethlehem shops.

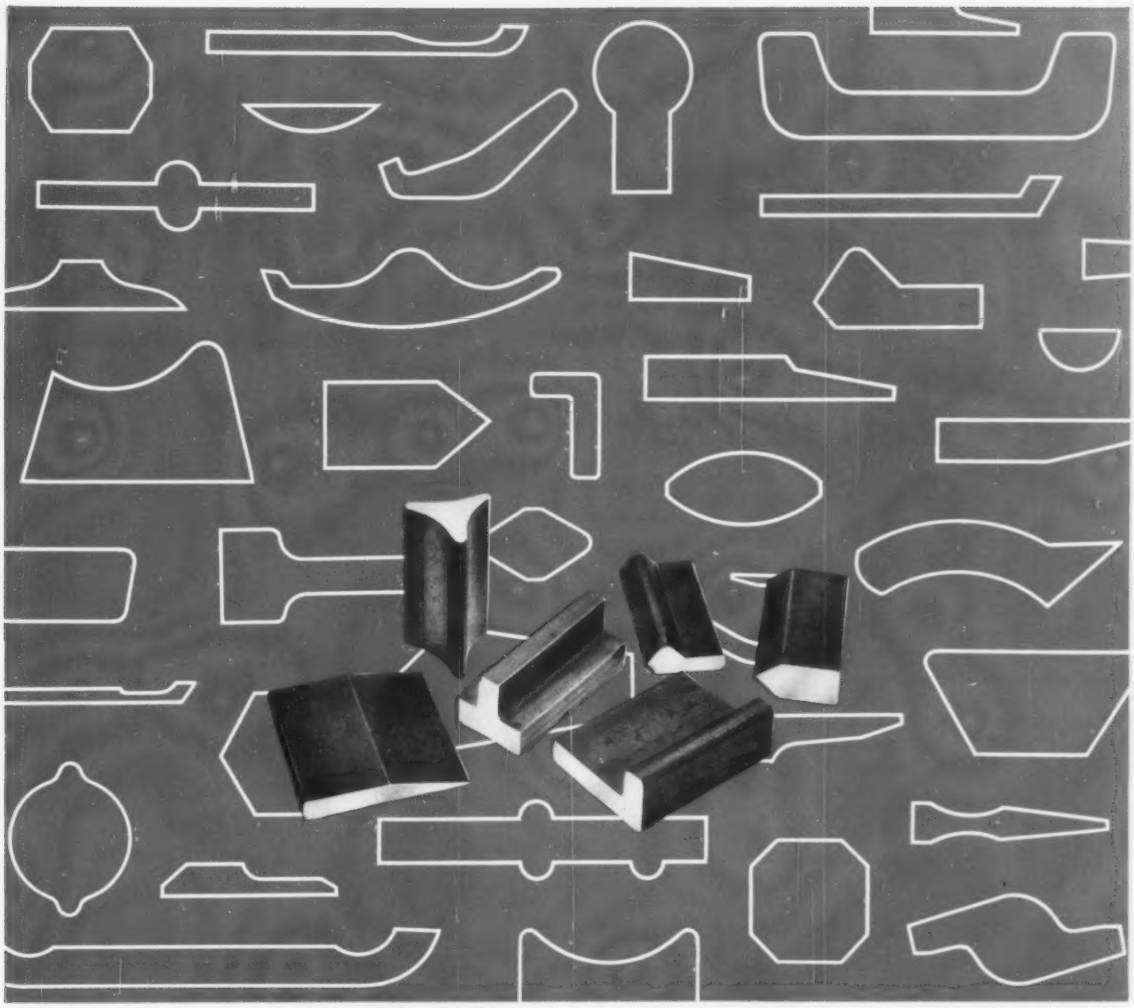
Tonnagewise, the forgings in this exhibit are small. But as we've said so often, our shops welcome the lightweight jobs, and give them the same careful handling as the heavy-tonnage items. We have produced some of the biggest forgings on earth, and some of the smallest. No matter what size you may need, or what type, we will always be glad to take care of your requirements.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Crucible special shapes

for better special steel parts at lower cost . . .

If you're machining intricate sections from solid bars—or using expensive forgings—stop! Choose instead, a *Crucible special shape* that approximates the finished part. *Crucible special shapes* eliminate rough-machining operations . . . reduce scrap losses.

There's practically no limit to the *special shapes* available at Crucible, in a wide variety of special steels. Rolls for over 400 special shapes are available—other shapes can be rolled to your specifications. Your local Crucible representative can give you the whole story of how *special shapes* can cut costs—save time. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

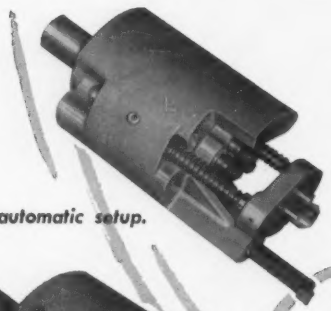
For more information fill in page number on Inquiry Card, on page 237

Heads...You Win!

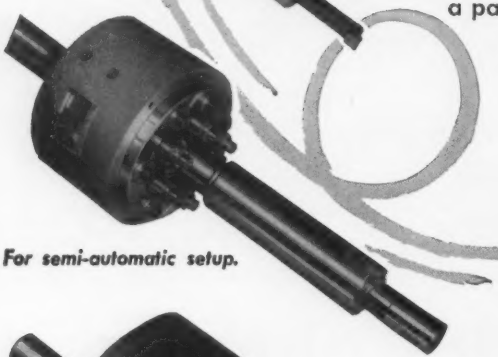
U. S. DRILL HEADS, THAT IS!

Regardless of the size of your shop, if you have high production jobs, you'll find an extraordinary reduction in tooling and manufacturing costs when you use U. S. Drill Heads.

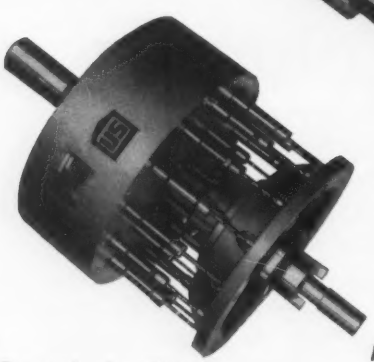
The heads shown here, moderate in cost, are for use with automatic chucking machines and turret lathes, for drilling or tapping operations. They provide, in most cases, that a part can be completely finished in one handling.



For automatic setup.



For semi-automatic setup.



For semi-automatic setup.

Manufacturers of all types of adjustable, fixed center and individual lead screw tapping heads.

US DRILL HEAD

THE UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET • CINCINNATI 4, OHIO

For more information fill in page number on Inquiry Card, on page 257

Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributors: Bethlehem Steel Export Corporation

They're Using Cr-Mo-W Die for Fan Hub Part

Economy and long service life were the chief reasons that led Production Die Casting Company, Houston, Texas, to select Bethlehem Cr-Mo-W tool steel for the manufacture of this hub for an attic fan.

The two-part die, with Cr-Mo-W (chrome-moly-tungsten) used for both sections, is approximately 16 in. x 18 in. The part is cast of aluminum alloy, at 1250 F. Engineers at Production Die Casting Company say, "Performance of this die has been excellent. It has provided long, satisfactory service life."

Cr-Mo-W is an ideal tool steel for applications involving drastic changes in temperature, where heat-checking and shock are a problem.

Cr-Mo-W is our general-purpose type of hot-work tool steel. It hardens in air, and has good red-hardness and good machinability. Your Bethlehem distributor carries it in stock, in sizes to meet your needs.

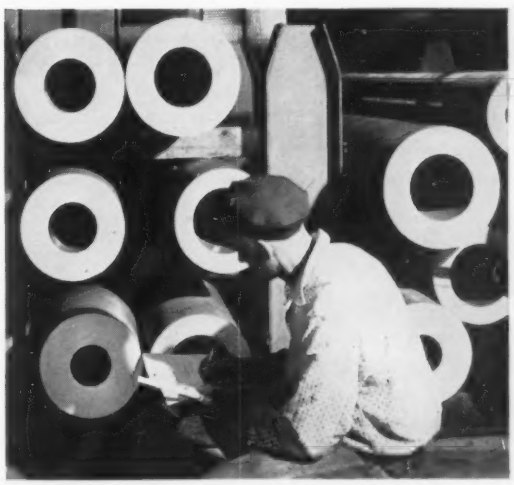
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Smooth Finish in Grinding Improves Tool Life

A smooth ground finish on tools with a cutting edge is essential to good tool life. This was proved recently in an application involving the use of our Lehigh H tool steel in a rotary slitting knife.

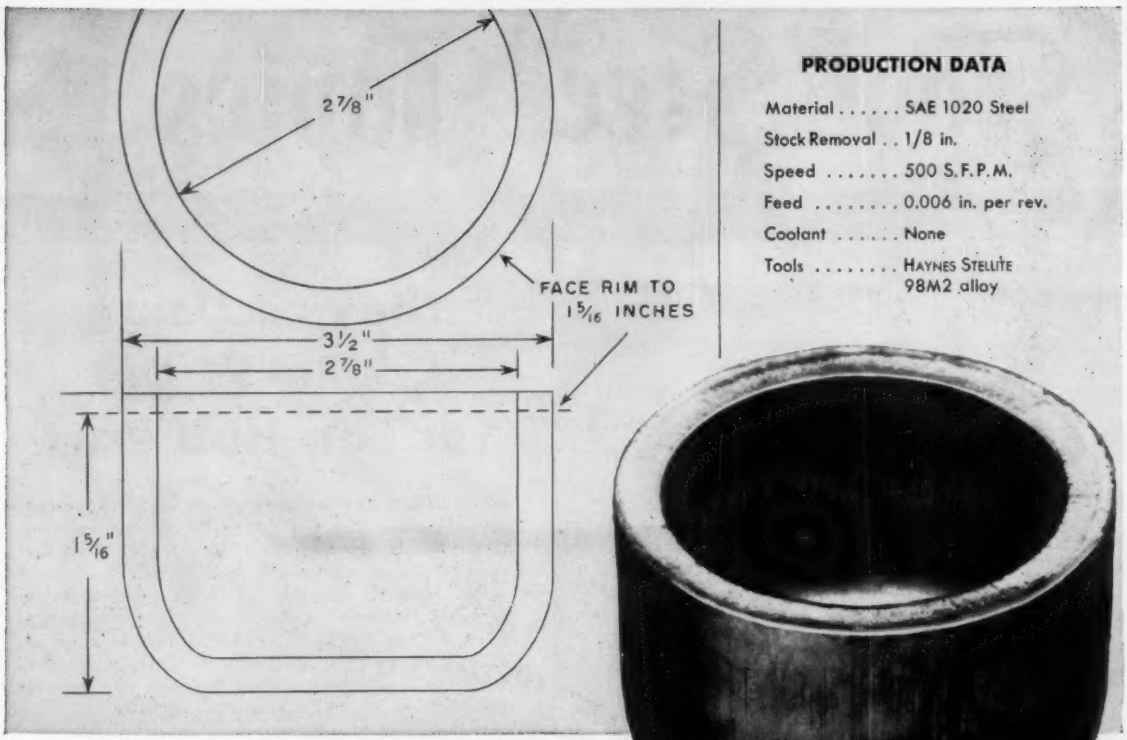
In normal operation on hot-rolled strip these knives cut about 8000 tons per edge on the original grind. But after being reground in the mill, production dropped to about 3000 tons per edge. Investigation revealed that the reground finish was rough and coarse, which meant in effect that the cutting edges were already dulled before being used in service. When the same knives were properly reground with a smooth finish, production again averaged 8000 tons per edge.

Generally, a smooth ground finish of from 10 to 15 micro-inches on a profilometer is satisfactory for good cutting-edge performance. In the event that coarser finishes are used, you may find production decreased.



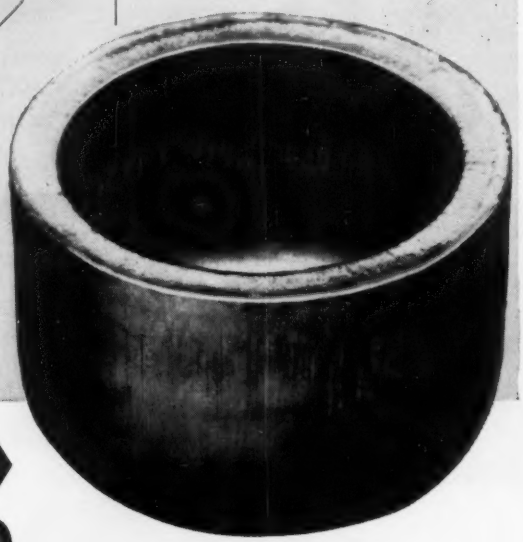
"HOLLOW-BAR" IN TWO TYPES

Bethlehem Hollow-Bar Tool Steel is now made in two types: BTR (Bethlehem Tool Room, oil-hardening), and Lehigh H (high-carbon, high-chrome). Hollow-Bar is made by a high-speed trepanning process, by which hammer-forged or hot-rolled bars are cored out, then rough-turned on the outside. Hollow-Bar is an ideal time-saver on hardened bushings, ring dies, draw-rings and the like because the steel can be put right to work. There's no need to wait for forged rings or discs.



PRODUCTION DATA

Material	SAE 1020 Steel
Stock Removal	1/8 in.
Speed	500 S.F.P.M.
Feed	0.006 in. per rev.
Coolant	None
Tools	HAYNES STELLITE 98M2 alloy



1,000 PIECES MACHINED PER GRIND ...despite rough, uneven cut

HAYNES STELLITE 98M2 tools machine over a thousand of these torque converter cups between grinds. The cups are deep drawn from SAE 1020 steel, and are plunge cut. The area to be machined is rough and uneven. The HAYNES STELLITE tools operate for a full eight-hour shift, at a speed of 500 surface feet per minute, without chipping or spalling. No coolant is used.

HAYNES STELLITE tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. This same combination of properties makes them valuable on all machining jobs. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they can take deep cuts.

For information on how HAYNES STELLITE tools can help speed up your machining jobs, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, and the machinability of metals.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

The steel that could take anything but a bath

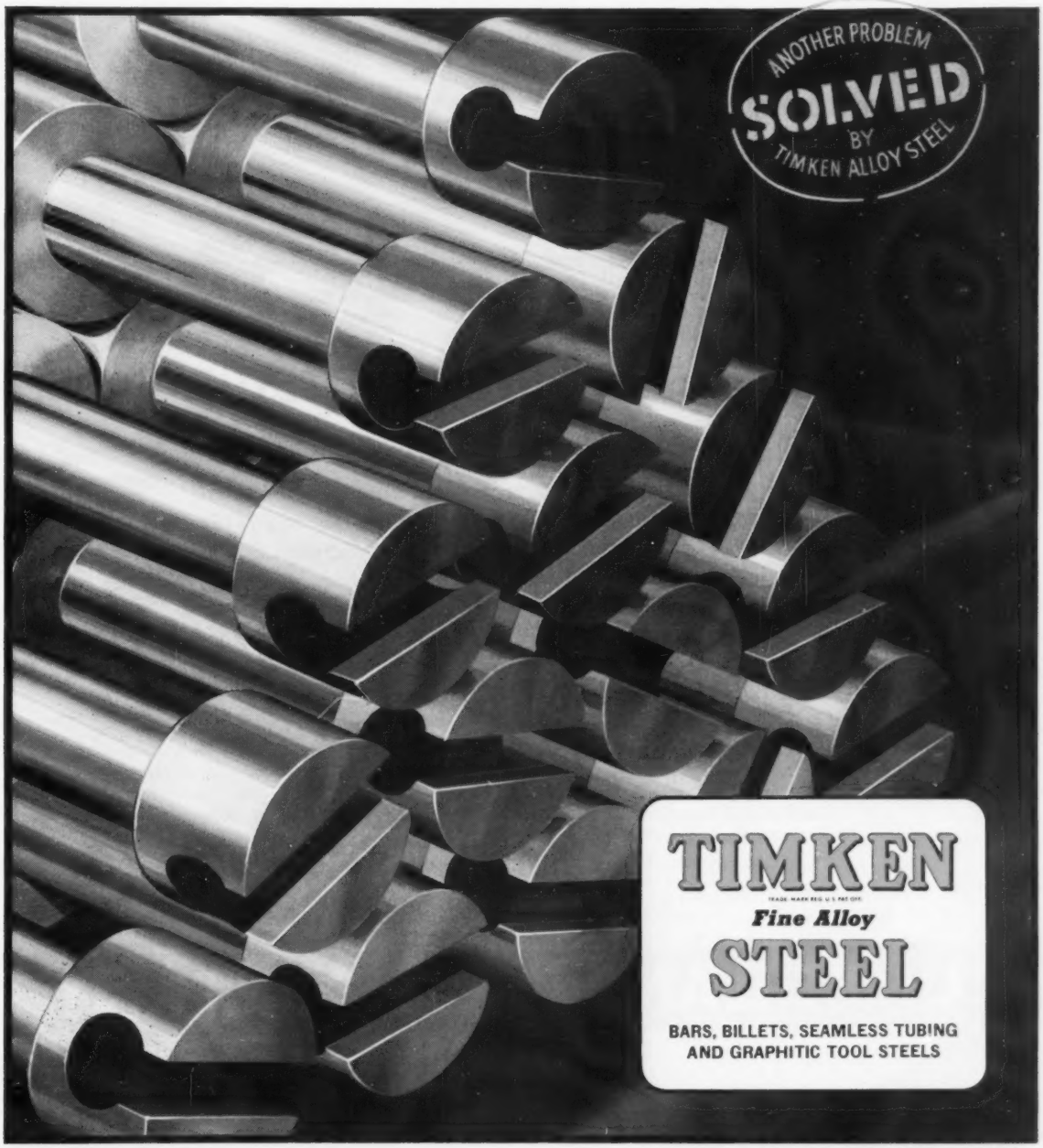
IN steel mills and warehouses, a roller leveler straightens wide sheets and heavy plates between powerful steel rolls and shoots them out flat and level.

As you can imagine, the stress on the rolls is tremendous. To make them strong enough and tough enough, one roll manufacturer was using an alloy steel, 52100. Then to make the rolls *hard* enough, they were heated to a high temperature and quenched in a liquid bath. But the severe quench was causing many of the rolls to warp.

The roll maker brought his problem to metallurgists of the Timken Company. "Could rolls be made from 52100 steel that wouldn't distort in quenching?" Their considered answer: Yes—if the steel were uniform, from lot to lot, in analysis and hardenability.

So the roll maker changed to 52100 steel made by the Timken Company. They found the steel *was* uniform—lot to lot . . . heat to heat . . . year in, year out. The roll maker was able to standardize his heat-treating practice. Since the change to Timken steel, distortion has been practically eliminated.

Our files bulge with scores of problems that have been "Solved—by Timken Alloy Steel". Can we help solve a steel problem for you? Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". Tapered Roller Bearings, Alloy Steels and Seamless Tubing, Removable Rock Bits.



COPR. 1956 THE TIMKEN ROLLER BEARING COMPANY

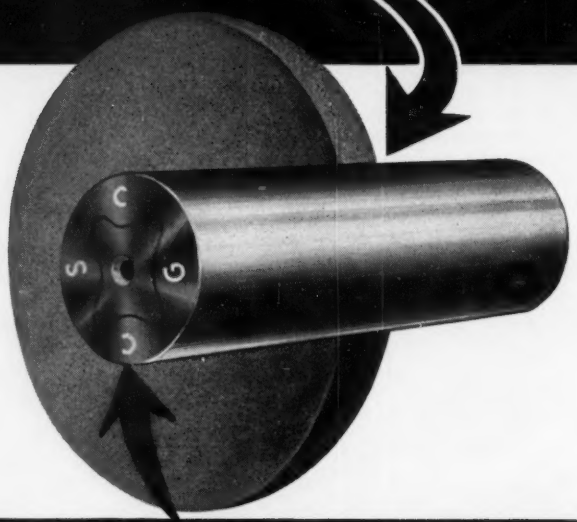
For more information fill in page number on Inquiry Card, on page 257

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,
smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

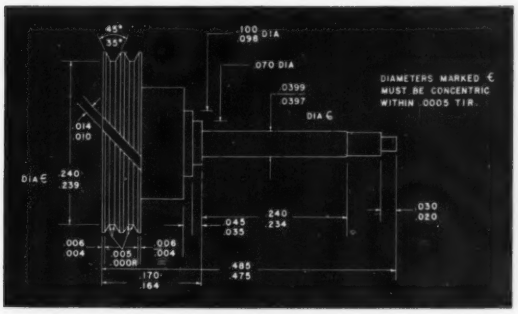
MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

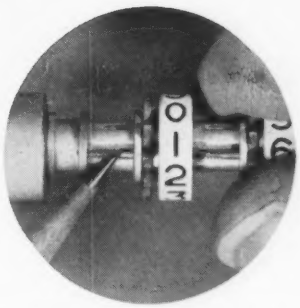
CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

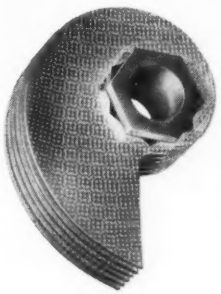
ESTABLISHED 1845 **INCORPORATED 1892**



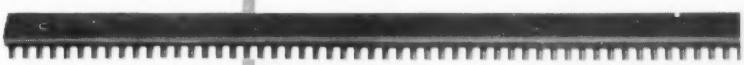
Inspection of incoming precision shafts took 10 to 15 minutes each by mechanical gaging—involved concentricity, diameters, shoulder locations, and other tough-to-measure dimensions to tolerances of .0002". Doing the work on a Kodak Contour Projector cut time to 2 to 3 minutes per shaft.



The problem was to check many small calculating machine parts averaging about 13 critical dimensions for each with shapes mostly complex. With carefully engineered mechanical gages, inspection time averaged 50 seconds each. Optical gaging on a Kodak Contour Projector brought the average down to 12 seconds.



Spacing the parallelism of a special tuning condenser for electronic test equipment had to be held to very close tolerances. "Use of the Kodak Contour Projector," the company reports, "permits economical measurements of parallelism to an accuracy impossible to obtain by other methods."

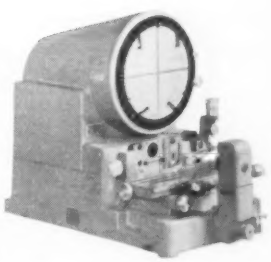


On a flexible rubber-like part, rejects ran as high as 30%. By using a Kodak Contour Projector to measure the parts and then plotting results by statistical quality control methods, production changes were made that resulted in rejects dropping from 30% to less than ¼ of 1%. Optical gaging eliminated distortion of the part while gaging, and proved 4 to 5 times faster than usual methods.

One instrument inspects these varied parts

Here is another economy optical gaging can provide: switching from one part to a second part requires only a change of chart and fixture. You still use the same basic instrument. And with a Kodak Contour Projector, the variety of parts you can check is almost without limit. Here's why:

1. *Capacity*—Screen size on an optical comparator does not restrict the size of parts you can handle, for multiple-position fixtures allow the handling of parts larger than the screen itself. What's important is the staging area—and Kodak's unique relay lens provides uniform ample clearance regardless of magnification. The distortion-free image lets you measure anywhere on the viewing screen. The choice of lenses, of horizontal or vertical projection, and of surface or shadow illumination gives you the greatest possible flexibility.
2. *Ease of operation*—Kodak Contour Projectors are designed for maximum speed and minimum operator training. The bright screen image reduces fatigue, lets you use the instrument in normal room light. Images are erect and unreversed at all magnifications. Finger-tip controls are within convenient reach of the operator.
3. *Optical stability*—The adjustment-free optical elements on Kodak Contour Projectors eliminate the need for operator adjustments. Rigidly mounted lenses and mirrors maintain alignment and position. Rugged construction withstands rough and heavy use.



Whether you are now using optical gaging or just considering it, you should have a copy of the booklet, "Optical Gaging with Kodak Contour Projectors." It gives complete details on Kodak optical gaging equipment and how it can work for you. Write to *Special Products Sales Division.*

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK

WIN a 2-weeks LUXURY

All Expenses Paid,

ENTER JONES & LAMSON'S

NEW HORIZONS

Grand Prize:

Two-Weeks Luxury Vacation Trip for Two, All Expenses Paid, to a choice of one of the following: Paris, Hawaii, The Caribbean, The Canadian Rockies, Plus $400 for spending money, baby sitter fee, etc.

Two 2nd Prizes: Each a Seven-Day All-Expenses-Paid Luxury Vacation for Two to Bermuda. Plus $200 spending money.

Three 3rd Prizes: Each a Shopmaster Combination Saw-Jointer Power Tool, complete with motor.

Ten 4th Prizes: Each a Shopmaster Individual Single-Purpose Power Tool (A Choice of Saw, Drill Press, Jointer, etc.)

Jones & Lamson, famed for opening up NEW HORIZONS in metalworking efficiency, now offers you, personally, NEW HORIZONS — a luxury vacation for two people for two weeks with all expenses paid, to your choice of Paris, Hawaii, The Caribbean or The Canadian Rockies.

Think of it — you can enjoy deluxe travel, finest hotels and accommodations, the very best of everything, plus $400 spending money. Live like a millionaire for two weeks, for just answering this question, "Which Jones & Lamson machine, or machine feature, could, or does, help you most, and Why?"

When you write in (use coupon or not, as you wish), we will send you an official entry form, together with information upon which to base your answer. So don't delay! Even if you've never entered any contest before . . . if you have a good idea and can express it clearly — *YOU* may win this glorious luxury vacation for two! And don't forget — there are other prizes! — two deluxe 7-day all-expenses-paid vacations for two to Bermuda, and 13 prizes of famous Shopmaster home workshop Power Tools! Enter *today!* Read the simple rules, and send in this coupon *NOW!*

J&L JONES & LAMSON MACHINE COMPANY

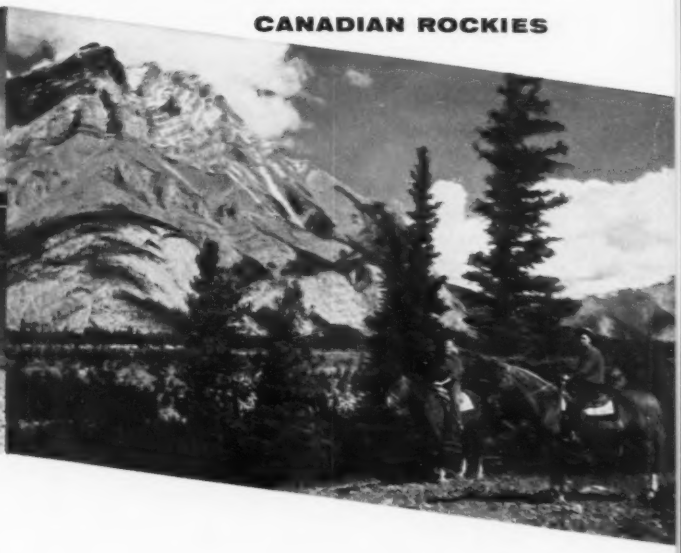
512 CLINTON STREET, SPRINGFIELD, VERMONT

VACATION FOR TWO!

to your choice of . . .

HAWAII

CANADIAN ROCKIES



CONTEST TODAY!

CONTEST RULES

Contest is open to all persons, residing in the continental U. S. A., engaged in metalworking or allied industries, except employees of Jones & Lamson Machine Company, its selling agents and its advertising agency, and members of their families.

Contestants merely answer, in 150 words or less, the question "Which Jones & Lamson Machine, or Machine Feature, could, or does, help you most, and Why?"

Entries are to be mailed to Jones & Lamson NEW HORIZONS CONTEST, Box 364, Back Bay Annex, Boston 17, Massachusetts.

Entry must be contestant's own, and must be handprinted or typed on an official Jones & Lamson NEW HORIZONS CONTEST entry form. Entry forms that are not completely filled out will be disqualified. Entry forms filled out in handwriting will also be disqualified. No entries will be returned, and all entries become the property of Jones & Lamson Machine Company.

The submitting of a contest entry implies the contestant's agreement with and submission to all contest rules. Contest entries must be postmarked by midnight July 10, 1956 and received by July 20, 1956.

Board of Judges will include machine tool engineers, production foremen, business executives, trade publication editors, and an engineering college faculty member.

Judges' decisions are final. Entries will be judged for aptness of thought, originality and sincerity. "Literary style", as such, will *not* be a deciding factor. Elaborate or "fancy" entries will receive no extra consideration.

Winners will be announced in Jones & Lamson Machine Company advertisements in trade publications as soon as possible after the judging of the contest.

Easy to Enter! You Could Win!

JONES & LAMSON MACHINE COMPANY
512 Clinton Street, Springfield, Vermont

Please send official NEW HORIZONS CONTEST entry form and information to:

*Name*_____

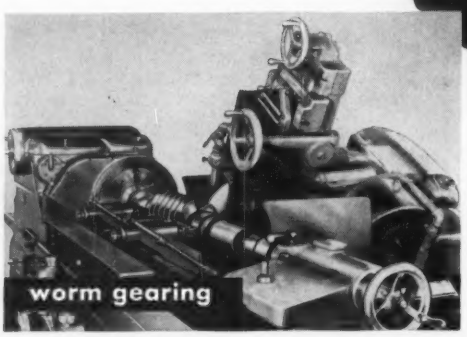
*Address*_____

*City*_____ *Zone*____ *State*_____

PHILLIE GEAR®

WORM GEARING

by "Phillie Gear" assures you accuracy... efficiency ...dependability



Worm grinding is an operation which is essential to successful worm gear operation... When worms are heat-treated for maximum surface hardness, the hardening process often produces changes in the lead angle and tooth profile, and always leaves a rough scaly surface on the threads. Worm thread grinding will correct errors of lead and profile, and produce a mirror-smooth surface finish, which is highly important to worm gear tooth action. Philadelphia worms up to 12" pitch diameter, 1 diametral pitch, are thread ground on our modern equipment.

Compactness • High Shock load and over-load capacity • Easy maintenance • Interchangeability of Components • Smooth torque flow • Positive control of work on driven machines • Long service life (worm gearing frequently improves with use) • Trouble-free performance • Good efficiency.

Any Worm Gearing, is, of course, only as good as the knowledge and equipment of its maker, plus the quality of alloys and methods used in making both Worm and Worm gear—This is where "Phillie Gear" is really tops.

Send for 72-page Gear Book #G-655, which tells you all about Worm Gearing, as well as other types of gears.

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ERIE AVE. & G ST., PHILADELPHIA 34, PA.
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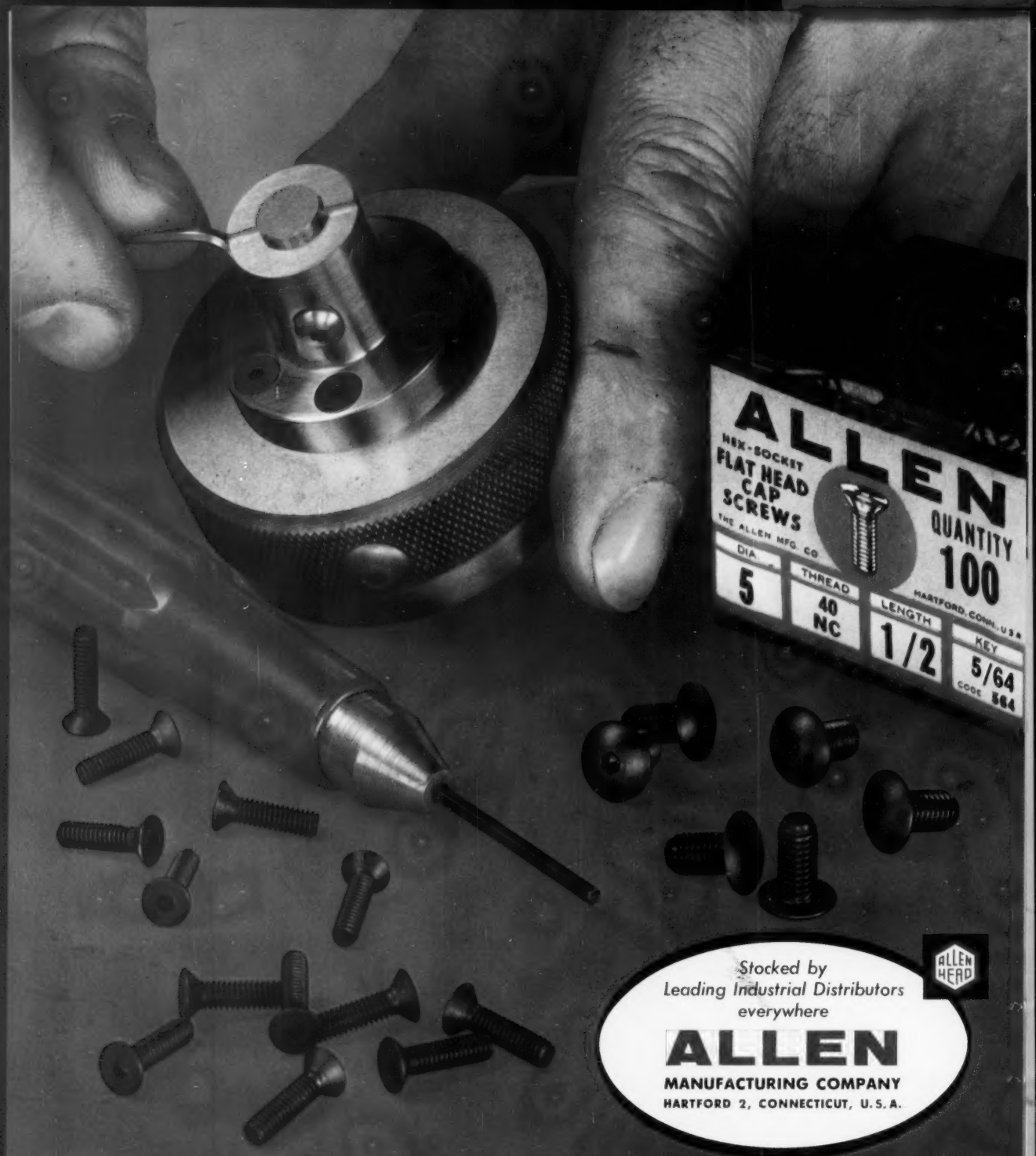
BALTIMORE • CLEVELAND
Virginia Gear & Machine Corp. • Lynchburg, Va.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

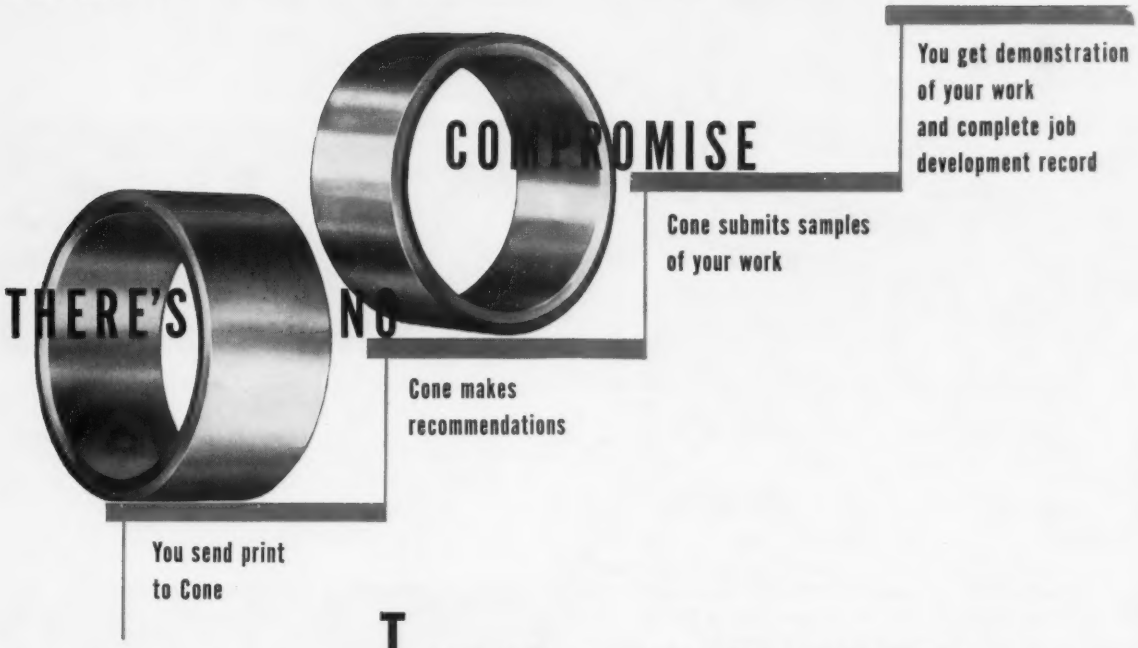
Established 1892

For tool
and work holding
it's
Jacobs
CHUCKS
Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.
The Jacobs Manufacturing Company • West Hartford, Connecticut



Your hardest fastening jobs are just what Allen Leaderpoint Cap Screws are made for!

No. 6 in a series


THERE'S NO COMPROMISE
You get demonstration of your work and complete job development record
Cone submits samples of your work
Cone makes recommendations
You send print to Cone

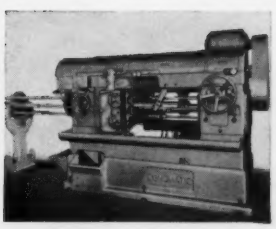
There is no adequate compromise with efficient production practices, if you are in business for a profit.

But you don't always know just how competitively efficient your equipment is. Case histories of what the other fellow is doing are sometimes garbled. At least the poor ones are not advertised. And conditions vary in all plants. Sometimes you have reason to be more concerned with what you don't want in new equipment than with what you do want. Cone believes too much is at stake for a machine to go into a line unequipped for the job, with either carbide or hss tools.

The Conomatic Carbide Development treats each job individually from standpoint of work, machine, tools, and operating personnel.

DATA FOR COMPARISON

Part	Bushing	Length	⅝"
Machine	1⅝" Conomatic	Hole Dia.	1¼"
Tools	100% Carbide Tipped	RPM	825
Material	8620	Time	14.8 Secs.
Stock Size	1⅝"		



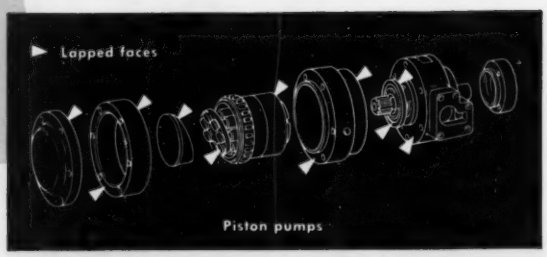
Conomatic

For particulars send for "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

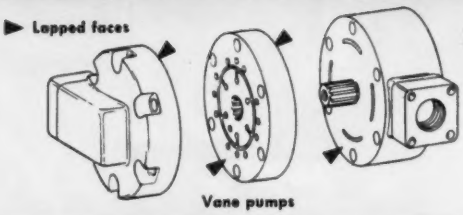
How Pump Manufacturers Use the

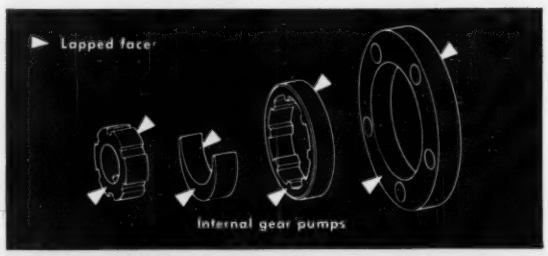
Lapmaster® To Improve Product Performance

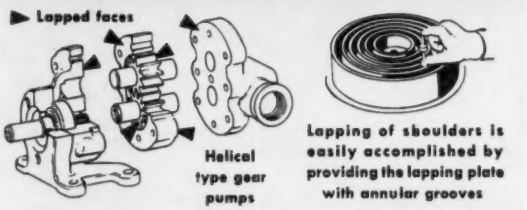


Like valve manufacturers, a large number of pump manufacturers need precision flatness and finish in order to insure efficient product performance. They're getting *both* flatness and finish plus parallelity in production quantities with Lapmasters. Photos at right illustrate a few typical parts being machined daily.

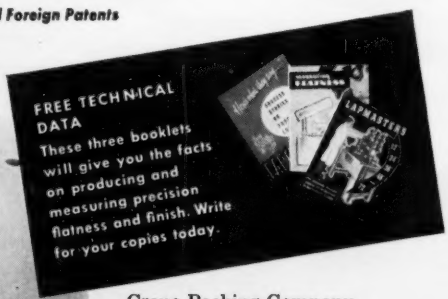
The high production accuracy of the Lapmaster (micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.



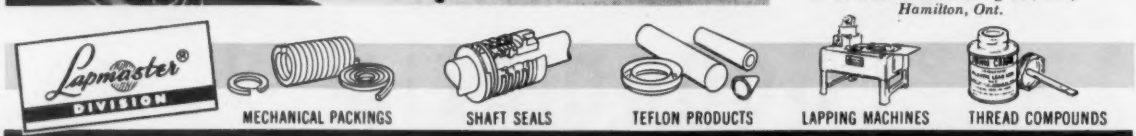



Lapped faces
Helical type gear pumps
Lapping of shoulders is easily accomplished by providing the lapping plate with annular grooves

*Protected by U.S. and Foreign Patents


FREE TECHNICAL DATA
These three booklets will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.
LAPMASTERS

Crane Packing Company
6433 Oakton St., Morton Grove, Ill.
(Chicago Suburb)
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.



CRANE PACKING COMPANY

INCREASE GEAR SHAVING OUTPUT *with* VERSATILE SEMI-AUTOMATIC LOADING

The operator handling a conventional rotary gear shaving machine is required to make 7 separate motions for each work part shaved.

With semi-automatic loading this is reduced to just 3 operations.

1. Place work gear on the pre-locater.
2. Press the start button.
3. Remove the shaved gear.

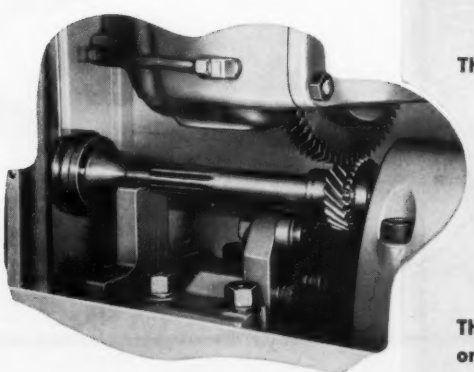
The rest of the cycle is automatic.

Results are:

- Higher production
- Lower machining costs
- Less operator fatigue
- All the versatility of conventional shaving
- Greater safety
- Operator has ample time to serve 2 or more machines

The approximate work locater and head and tailstock centers or plugs are the only work part changes that are additional to a conventional gear shaver.

Red Ring Shaving Machines, Models GCU and GCI may be equipped with this equipment.



Write for Estimated Savings on Your Particular Operation.

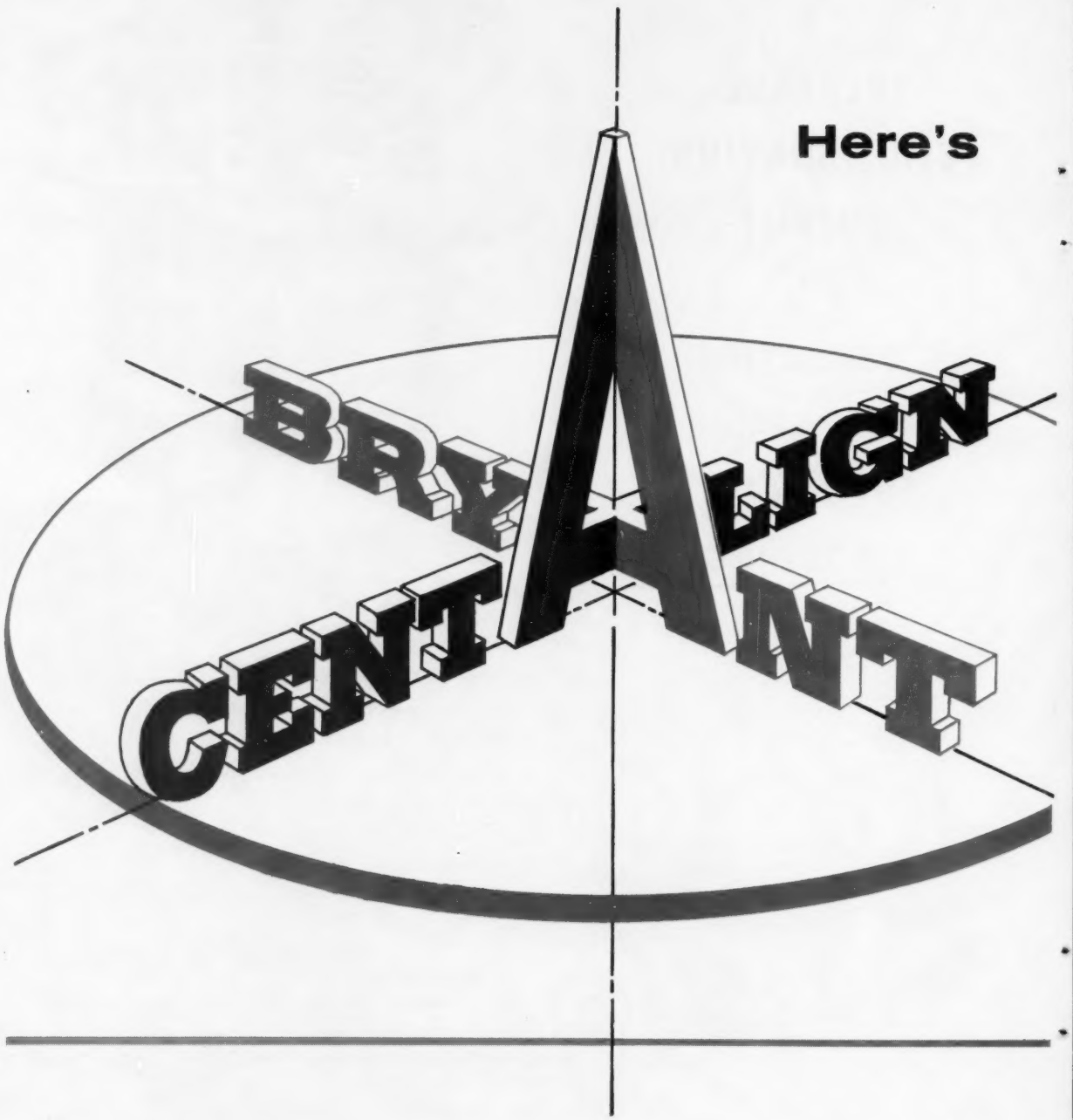
Plastic Splash-Guard Used for Demonstration Only.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

7388 *WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT*

For more information fill in page number on Inquiry Card, on page 257


Here's
BRY-ALIGN
CENTANT

what you've been asking for—

the new Bryant "Centalign" Automatic Internal Grinder

Designed and built to your requirements (as expressed to us over several years) for a machine capable of high production, lower-cost internal grinding, embodying the latest developments in shoe centerless grinding and adapted to automated lines. Ask for a demonstration.

BRYANT Chucking Grinder Co.

20 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers

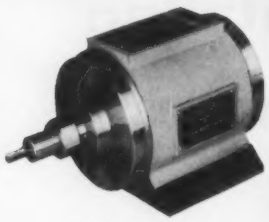
For more information fill in page number on Inquiry Card, on page 257

"over 14 billion revolutions and still going strong"

"50% more wheel life" "better surface finish"

"way better wavometer readings"

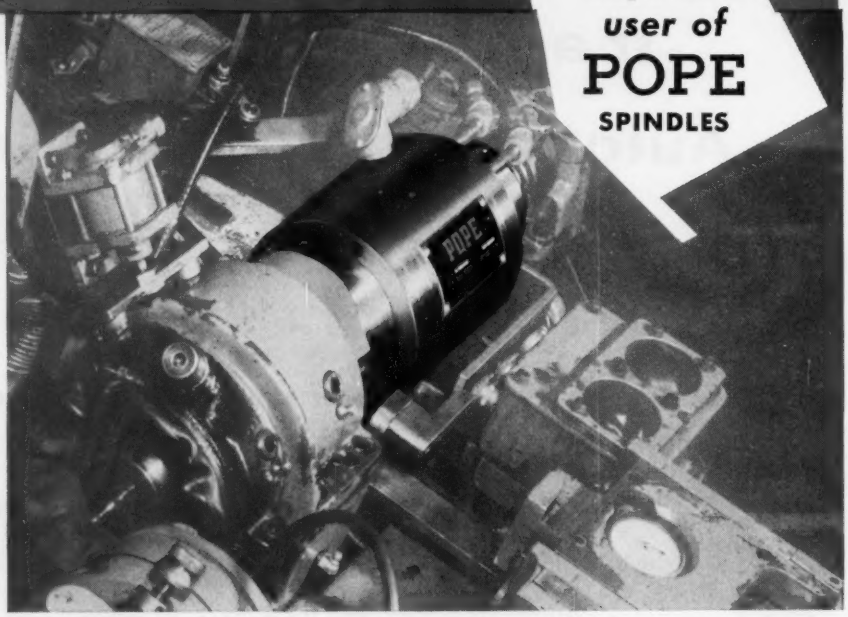
says this user of POPE SPINDLES



THIS IS THE SPINDLE for Quick, Low Cost Maintenance

You can disassemble, replace the bearings, reassemble and get this spindle back into operation in less than one hour, without removing the spindle housing from its set-up position — another cost-saving feature of Pope Hi-Cycle Spindles.

This rugged, long-lived Pope Spindle has the rigidity, both radially and axially, for *continuous* production of *accurate* parts. Spindles of similar design available for higher speeds.



THESE ARE THE BEARINGS

A pair of Fafnir Super-Precision MM201W1-CR spring loaded ball bearings are used in the Pope Hi-Cycle Wheelhead.

THE FAFNIR BEARING COMPANY operates POPE Heavy Duty, 72,000 RPM Hi-Frequency Wheelheads on No. 1 Landis Grinders for extra precision ball bearing race grinding.

Fafnir considers the extraordinary record of these POPE wheelheads in their own plant an outstanding example of both *spindle* performance and *bearing* performance, for complete *Fafnir* ball bearings are used in these Wheelheads.

What about *your* grinding operations? Do they call for fine surface finishes, uniformly dependable performance and trouble-free operation over long periods? If so, you need the engineering ingenuity and skilled craftsmanship, and the precision ball bearings, that you'll find in POPE Precision Spindles.

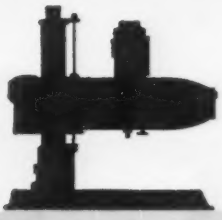
Write for specifications and quotations

No. 109

Specify **POPE** PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

For more information fill in page number on Inquiry Card, on page 257



NEW HEAD CONTROLS make Fosmatic Radial easier than ever to run!

Numerical Dials select feeds and speeds quickly, easily, with minimum possibility of error. Select even while drill is running, to save time on next operation.

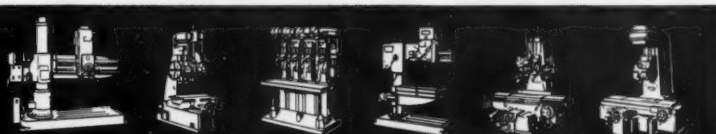
Single Control Lever starts, stops, reverses and shifts to feed and speed set on numerical dials.

Push Buttons on quick return levers engage feed. Feed is disengaged automatically by depth control or by pushing either button again. Magnetic clutch needs no adjustment.

Head Traverse Lever also elevates arm. Variable speed hydraulic motors drive both traverse screw and elevating nut. Clutches eliminated.

Other Fosmatic features include: 36 spindle speeds, 18 feeds, 4' to 8' arms, 13" to 19" columns, Boring Type Spindle, Safety Interlocks, Variable-Tension Counterbalance for Spindle, and optional Milling Feed.

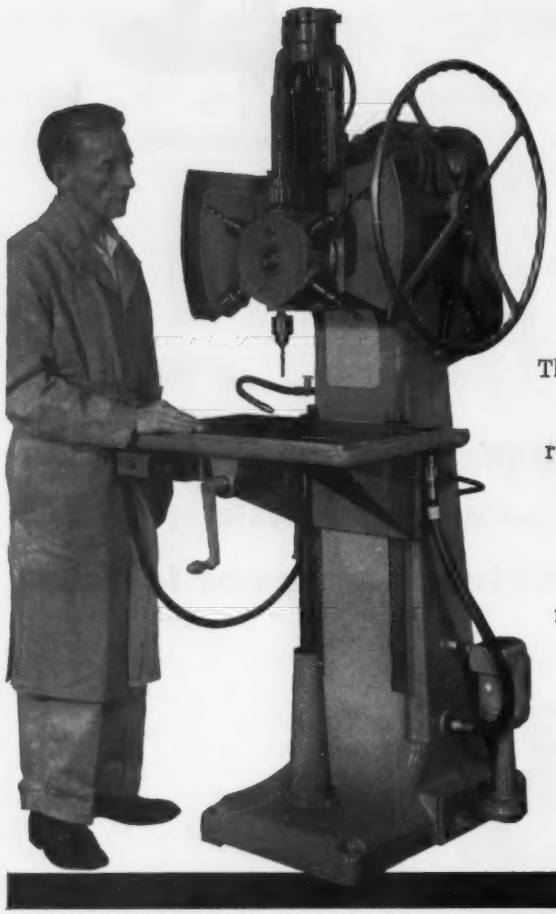
NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

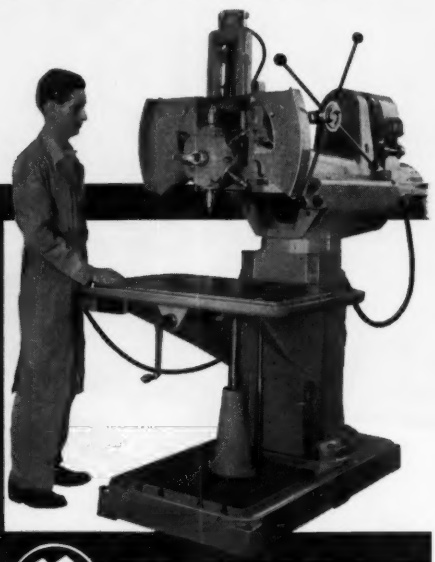
THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK



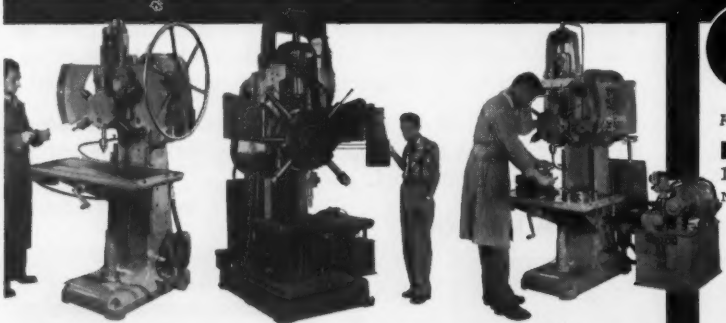
NEW
a sensitive, fast
BURGMASTER®
TURRET DRILL—Model 1C

The Model 1C Turret Drill expands the BURGMASTER line to include a smaller capacity, sensitive feed, fast operating machine. It is built to the same rugged standard for rigidity and accuracy evident in the larger BURGMASTER units. Users will experience such important benefits as fast power indexing; very sensitive hand feed; preselective speeds and stops; time savings and increased accuracy by elimination of quick change tools, or need for moving from one machine to another; easy handling of holes up to ⅜" in steel, thus freeing heavy duty machines for larger capacity work.



The *IMPROVED* Model 2BR
RAM TYPE RADIAL TURRET DRILL...

features a new sensitivity in handling, power indexing and power clamping. When the ram is clamped in position, the 2BR can function as a deep throat production turret drill, easily handling holes up to ¾". This machine greatly increases production on bulky pieces as all tools are mounted on the machine and are quickly indexed into position. The operator simply brings the spindle into position over the work, releases pressure on a button in the handle (located on turret head) and the machine automatically clamps ram and column. He is ready quickly to drill, tap, etc., thereby saving repositioning several times over a particular position.



2B HAND OPERATED (¾" CAPACITY) | 3BH AUTOMATIC HYDRAULIC (1½" CAPACITY) | 2BH AUTOMATIC HYDRAULIC (¾" CAPACITY)

For complete information, write Dept. M-4

BURG TOOL *Manufacturing Co., Inc.*
15001 S. Figueroa St., Gardena, Calif.
NEW YORK • CHICAGO • SAN FRANCISCO

"the machines that use their Heads"

For more information fill in page number on Inquiry Card, on page 257

Just plug it in, and it's ready to go!

NEW AUTOMATION CONTROL

This new nine-station rotary limit switch will control stops, starts, interlocks, motion, time, or recycles of auxiliary equipment. Each station can be set from 0° to 360°, can be operated either normally-open or normally-closed, and is accurate within less than 1°. Write for Bulletin 33.

BLISS "packaged presses" speed installation and simplify maintenance

Automation created the problem—The dopers, kickers, lifters and other materials handling devices so popular these days brought a maze of wires and pipes in their wake. And aside from looking untidy, they slowed maintenance and proved annoying to crane operators.

"Packaging" solved it—Now, in Bliss' new line of presses, all the pipes and wires, and controls are built into the uprights. Each air and electrical line is tagged—simple to find, simple to fix. Controls are centrally located. The exterior is clean and uncluttered—cranes can move up close to change dies.

Bliss designers have come up with completely new two point and four point presses—both single action and multiple action. Design features include extremely rigid frames, eccentric drives, high speed clutches, extra long connections, motorized adjustments and many others. The entire line of presses is described in a comprehensive 32-page catalog, No. 11-B, just published. Copies for you and your staff are available by writing to E. W. Bliss Company

BLISS
SINCE 1857

is more than a name...it's a guarantee

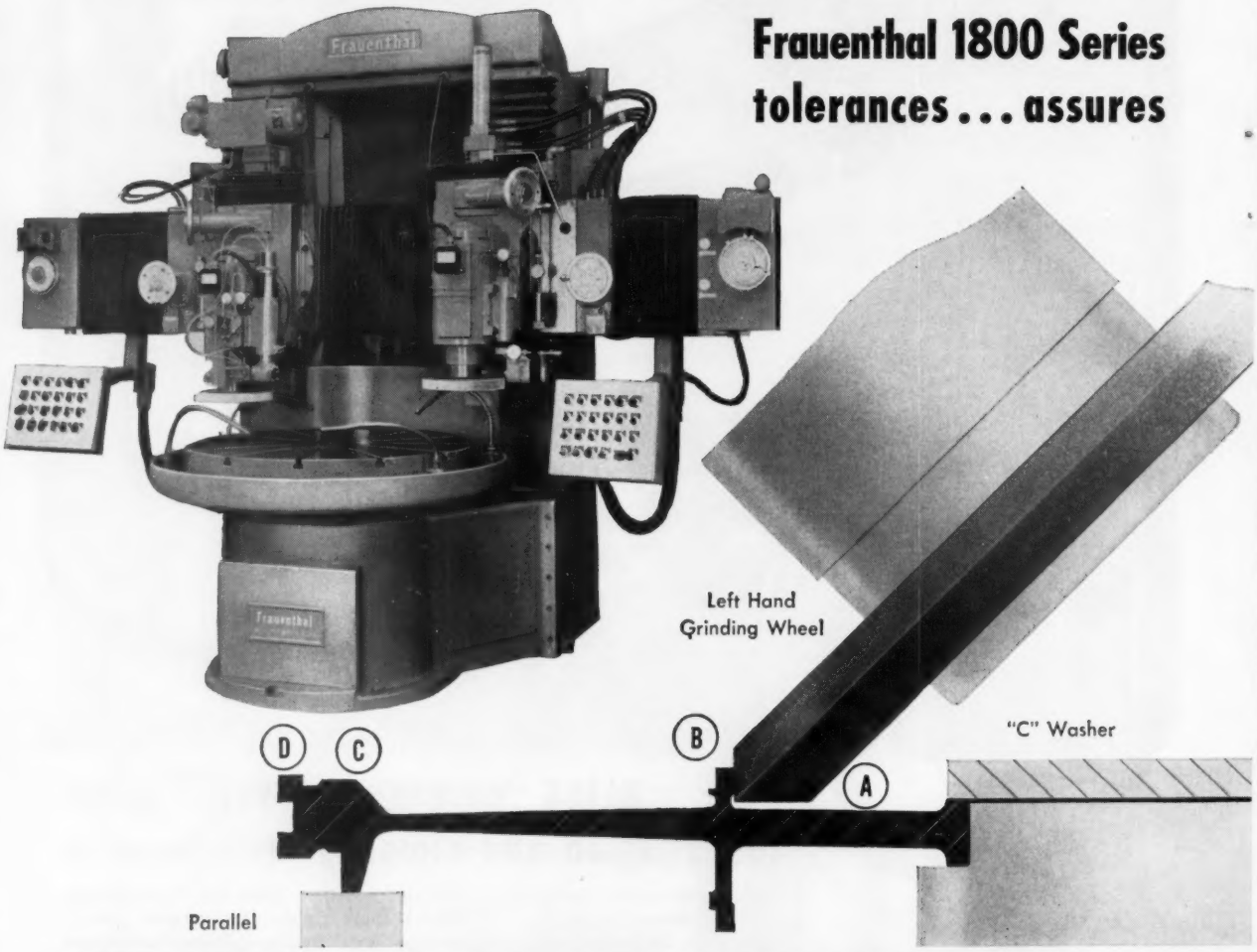
E. W. BLISS COMPANY, Canton, Ohio

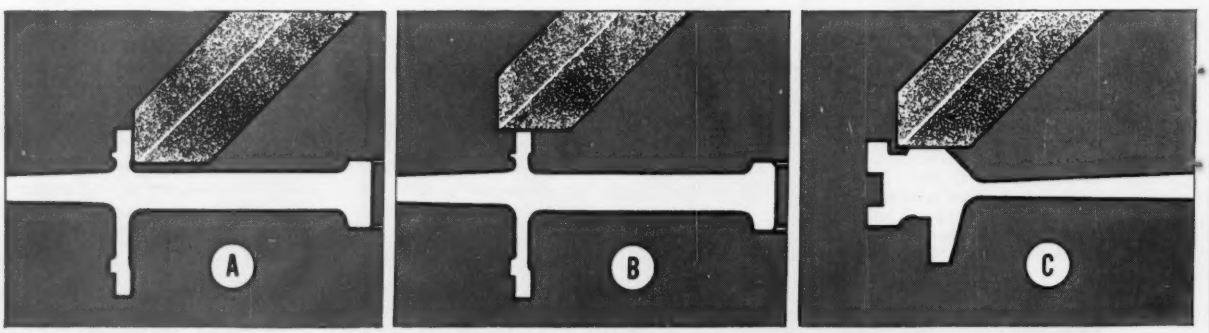
Presses, Rolling Mills, Rolls, Special Machinery

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif.; *Branch Offices in* Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France.
Other representatives throughout the world.

Multiple Grinding Operations

Frauenthal 1800 Series tolerances . . . assures





Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.

Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

Frauenthal Division

in One Set-Up

Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

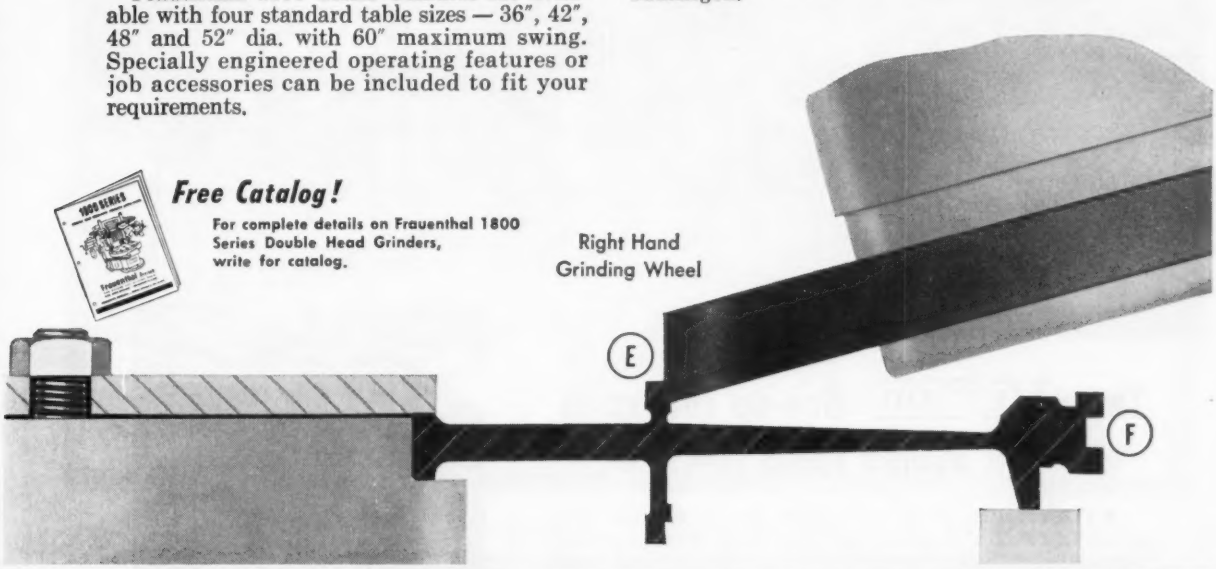
Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

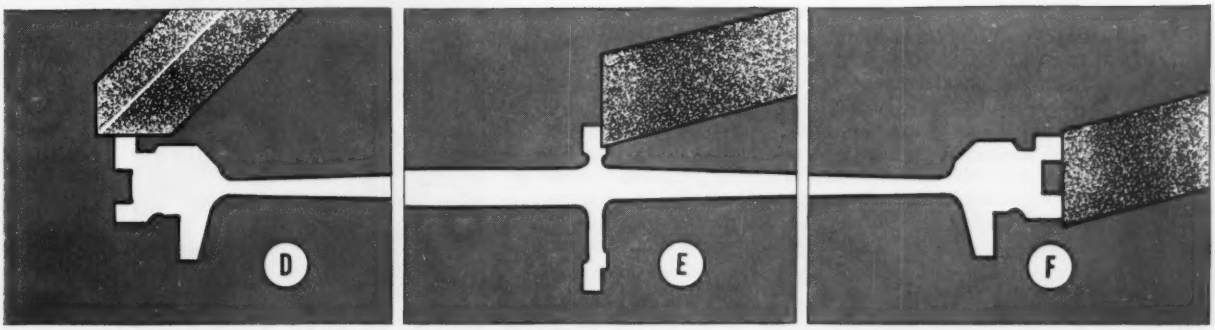
With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.

Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.

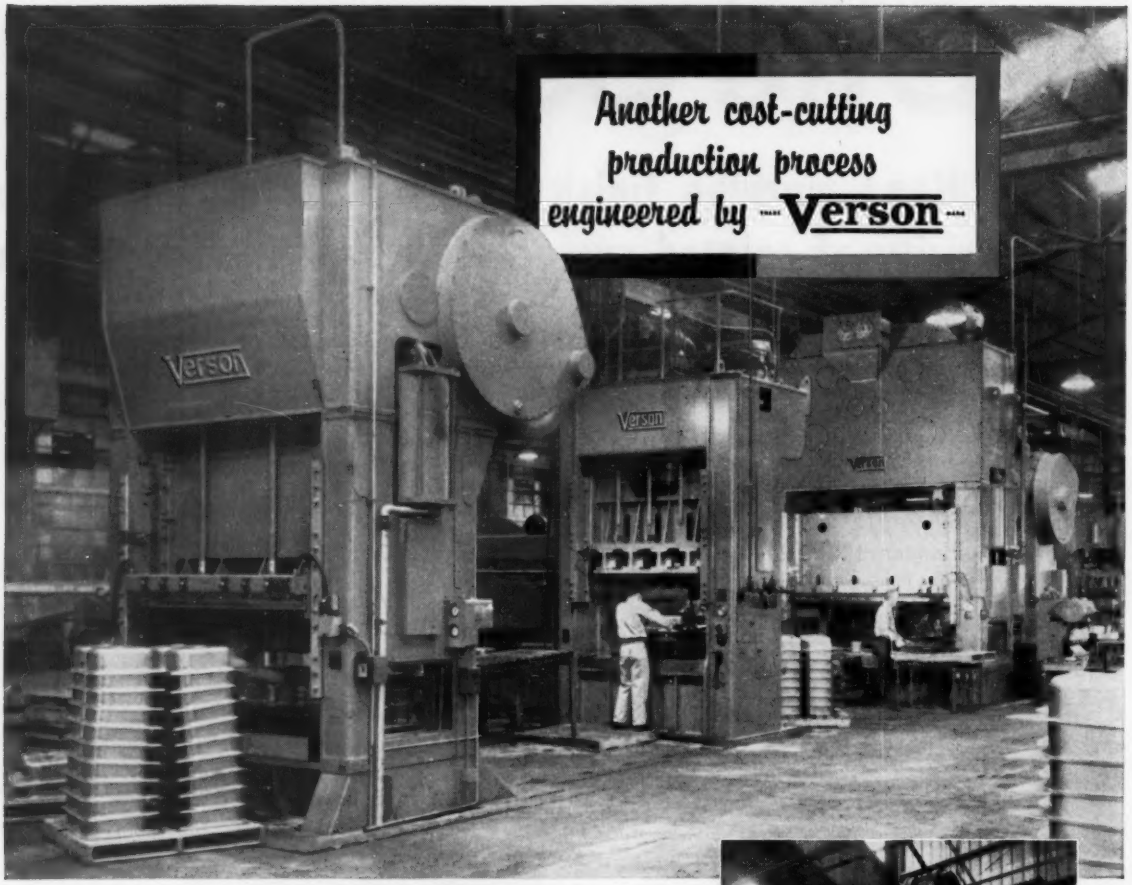




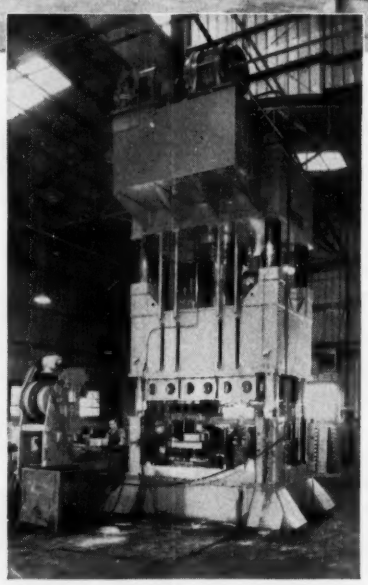
Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN



This TRADE Verson MARK line-up cuts costs on double sump sinks



• The press line illustrated above, part of the final operations in forming double sump sink units before porcelain enamelling, includes Verson eccentric, hydraulic and crank presses. Previous operations on the sinks include deep drawing the sumps to a depth of 7⅜" from 14 gauge Armco deep drawing stock on a 1000 ton Verson hydraulic press and piercing and embossing the center drain hole in the sinks on a Verson O.B.I. Both of these presses are shown at the right.

This is more than just a line-up of Verson presses . . . it's a production process engineered by Verson to cut costs as an integrated part of the complete manufacturing program. Verson has the experience and facilities to meet the most exacting press requirements . . . and the "know how" to blend these presses into an efficient and practical production process.

Put Verson facilities to work for you. Send an outline of your production requirements.

A Verson Press for every job from 60 tons up.

TRADE Verson MARK

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

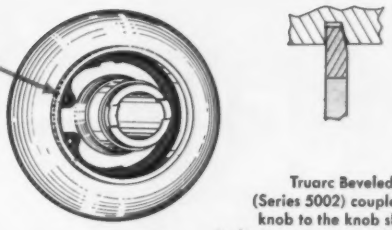
9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

Waldes Truarc Retaining Rings Eliminate Machining—Provide Stronger Assembly, Greater Accuracy

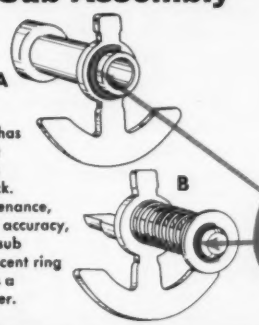
The American Hardware Corp., New Britain, Conn., uses 4 different types of Waldes Truarc Retaining Rings in the original design of these famous Corbin and Russwin Heavy Duty Cylindrical Locks. Truarc rings improve product performance, eliminate rejects, and cut labor costs.

Knob Sub Assembly



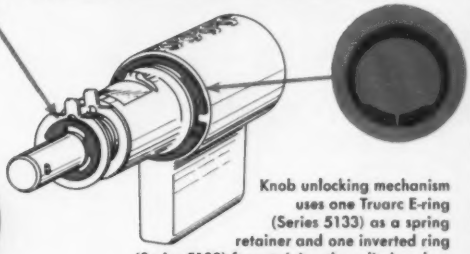
Truarc Beveled Ring (Series 5002) couples the knob to the knob shank. It eliminates two tapped holes and two screws, provides stronger assembly and greater accuracy. Beveled ring takes up end play rigidly.

Spindle Sub Assembly



Spindle sub assembly "A" has two Waldes Truarc crescent rings (Series 5103) used as locating flanges for rollback. This saves labor and maintenance, improves performance and accuracy, eliminates rejects. Spindle sub assembly "B" uses one crescent ring as a spring retainer and as a locating shoulder for washer.

Cylinder Sub Assembly



Knob unlocking mechanism uses one Truarc E-ring (Series 5133) as a spring retainer and one inverted ring (Series 5108) for retaining the cylinder plug. Rings are re-usable in the event of disassembly for maintenance. Rejects are eliminated.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES TRUARC® RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

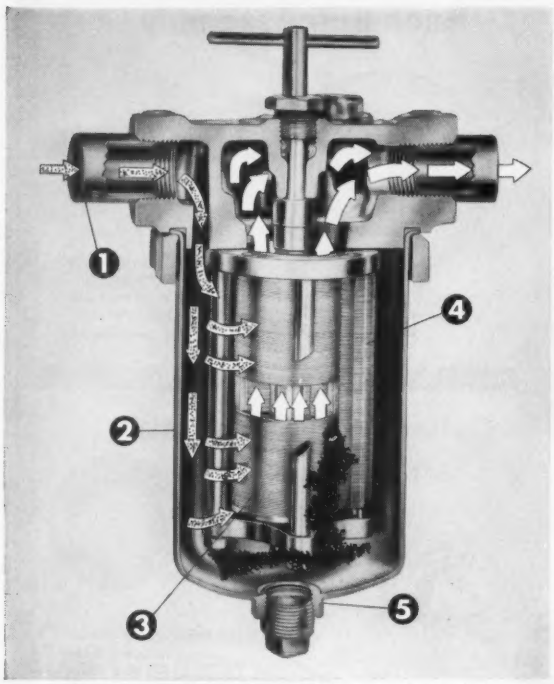
Name.....
Title.....
Company.....
Business Address.....
City..... *Zone*.... *State*.....

M048

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

For more information fill in page number on Inquiry Card, on page 257

NOW! 40-micron, self-cleaning filter
It's the new Cuno SUPER Auto-Klean



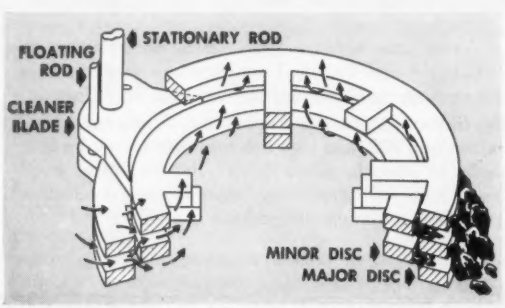
HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter (3). Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Cuno's new SUPER Auto-Klean is the first practical, compact micronic filter for lubricating oil, hydraulic fluid, coolant, fuel, and other industrial fluids.

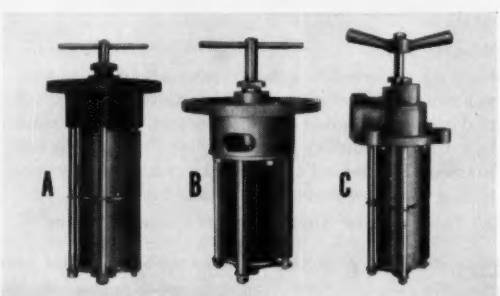
Many times smaller than other micronic filters of equal capacity, Cuno's new SUPER Auto-Klean filter now makes possible economical, micronic filtration at high flow rates and eliminates the need for replacement cartridges in most cases. Here's what it offers:

1. **Full-flow** 40-micron filtration with a self-cleaning filter. Positive protection against particles larger than 40 microns (actually 0.0015 in.). All-metal filter can't rupture or channel.
2. **Easy cleaning.** Just turn the handle—by hand or continuously with motor drive. No interruptions for cleaning.
3. **No cartridge changes.** Ends operating costs if you've been using cartridge filters.
4. **Low pressure drop, no pressure drop build-up.** An 8" by 2¼" SUPER Auto-Klean filters 30 gpm of 200 SSU oil with only 3 psi pressure drop—up to 75% more with slightly higher pressure.
5. **High capacity in a small package.** Many times smaller than replaceable-cartridge type filters of equal capacity, it saves with lower initial costs, lower installation costs.
6. **Easy to build into new equipment.** Available for line-type housings *(left)* or incorporation in sump or reservoir *(below.)* Works in any position.
7. **Easy to install in old equipment.** Fits existing Auto-Klean housings. You can easily replace most 2¼" diameter elements with SUPER Auto-Klean for finer filtration.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing equipment. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 15-4 South Vine Street, Meriden, Connecticut. 5.9



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against minor discs. Small arrows show flow. Short restrictions between minor and major discs stop 40-micron particles but allow high flow rate.



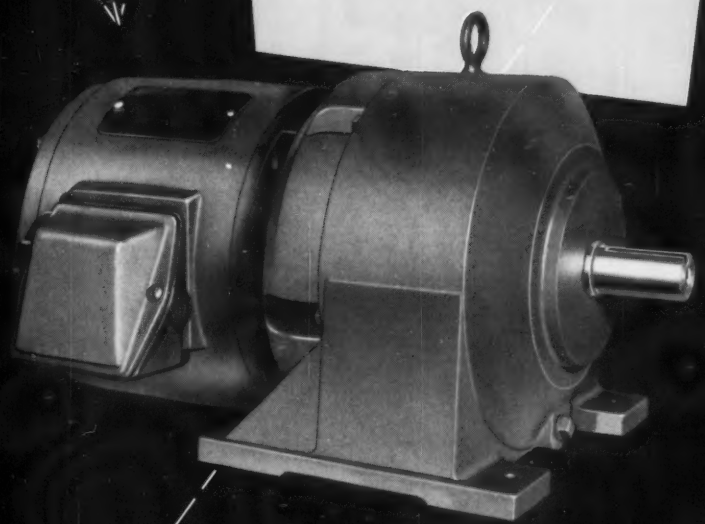
FILTERS FOR INTERNAL PIPING *(A and B above)* allow streamlined design plus the best infiltration. Flange mounting with external outlet *(C above)* and line-type *(large cutaway above left)* are just a few of many other possibilities.

CUNO **ENGINEERED FILTRATION**

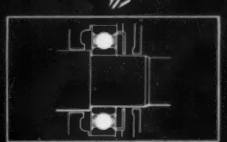
Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

Don't overlook what you can't see



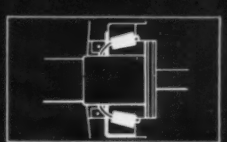
You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.



FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.

INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.

SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of breakdown.



THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

Find out the complete story for yourself—contact your Reliance representative or write for Bulletin E-2408.

E-1509

REDUCE SPEED

RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario

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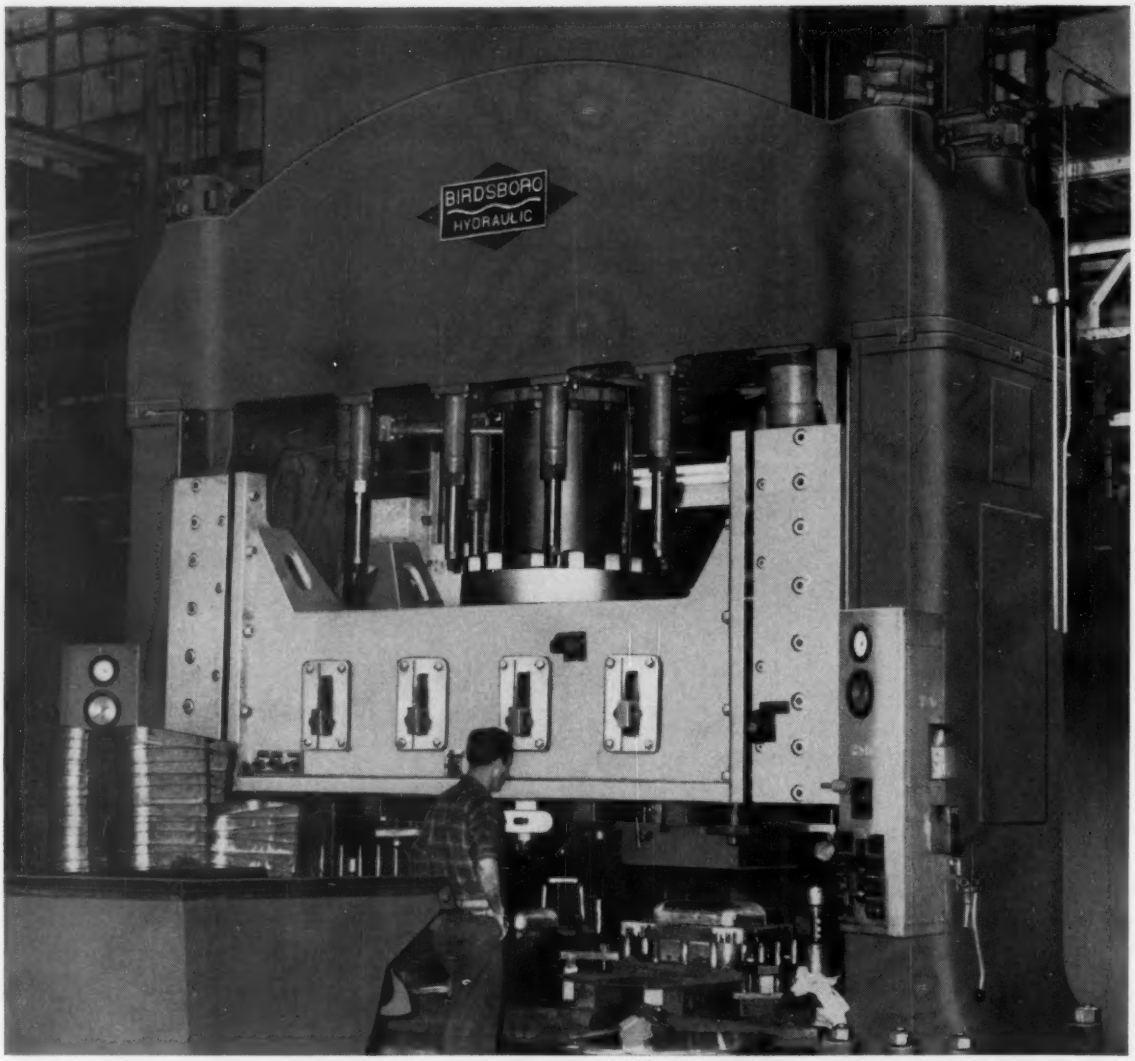


Here's Hydraulic Press speed, flexibility and accuracy to help you protect profit margins in sheet metal fabrication

Designers and Builders of:

STEEL MILL MACHINERY
HYDRAULIC PRESSES
CRUSHING MACHINERY
SPECIAL MACHINERY
STEEL CASTINGS
Weldments "CAST-WELD" Design
ROLLS: Steel, Alloy Iron, Alloy Steel

• Through BIRSDBORO advanced engineering, large sheet metal stampings can now be turned out faster to close tolerances by this single action, deep draw Hydraulic Press. Design features allow quick changing of dies for more flexible operation.

The press is of the housing and shrunk tie rod type with hydro-pneumatic cushion of 180-ton capacity in the bed. The main ram capacity is 600 tons and the working area 144″ left to right, 60″ front to back, and 60″ daylight opening.

When you're thinking about more profitable operation, call BIRDSBORO in to check over your problems. We'll come up with the specific press recommendations to meet your requirements.

NP-25-56

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

7 WAYS to SAVE MONEY with TOCCO* Induction Hardening

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½c saved on every piece — $4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.

Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of $375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from $1.57 to 10c apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11c per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.

Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from $5.45 to $3.25 per hundred parts—a savings of 2c per pin, $26.40 per production hour.

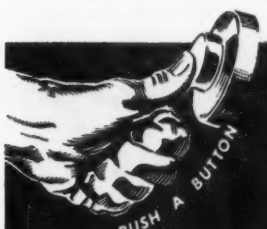
Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4c per piece—$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.

7

Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

THE OHIO CRANKSHAFT COMPANY



TOCCO

*Trade Mark Reg. U.S. Pat. Off.

Mail Coupon Today

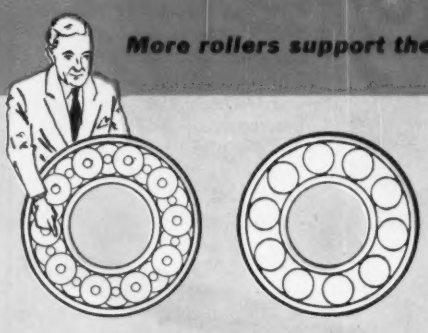
NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-4, Cleveland 1, Ohio
Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State____

For more information fill in page number on Inquiry Card, on page 257

This "STAGGERED" ROLLER DESIGN provides GREATER LOAD CAPACITY for your Heavy Duty Applications



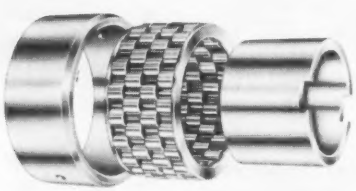
More rollers support the load

200 and 300 SERIES

Separable three-part construction—outer race, roller assembly, inner race. Choice of widths and lengths to suit conditions.

C-200 and C-300 SERIES

Bearings without inner race are denoted by C-200 and C-300 and can be operated on properly hardened and ground shafts.



T-200 and T-300 SERIES

Designed for use on standard commercial cold drawn shafts. Available for slip fit with inner race notched, or for press fit without notches.

COMPARISON OF LOAD DISTRIBUTION

End views of an Orange Staggered Roller Bearing and a conventional bearing show how staggered roller design brings maximum roller surfaces in contact with load. Alignment with raceway load area is maintained, skewing tendencies of long rollers is eliminated, resulting in unusually even, smooth running.

Greater load capacity, plus the wide design latitude of bearing types, permits you to save weight, space and cost by installing Orange Staggered Roller Bearings on heavily loaded, highly stressed applications. On new designs, you often can use smaller sizes . . . on change-overs in present equipment, you add extra margin of safety and smoother running.

Orange Staggered Roller Bearings are available in a full range of sizes, interchangeable with other bearings in these series. Engineering service and stocks in principal centers.

ORANGE

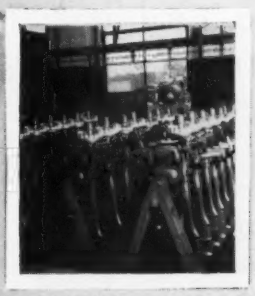
Write for latest Engineering Reference Manual M-55.

ORANGE ROLLER BEARING CO., INC.
552 Main Street, Orange, N. J.

ORANGE "STAGGERED" ROLLER BEARINGS

Not A Ski Lift, but an assembly line, used by Clinton to transfer engines from one building to another. There are 10 basic models ranging from 1.6 to 9 horsepower, and 10 Cities Service products help to make them.

"3,000,000 ENGINES IN EIGHT YEARS... CITIES SERVICE PLAYED MAJOR ROLE."



Outboard Motors are one of the chief products of Clinton Machine Company. Others include chainsaws and many types of gasolene engines for small power requirements.

Phenomenal is the word for Clinton Machine Company, Clinton, Michigan. Formed in 1946, it has expanded so rapidly that today it claims second place among U. S. producers of air-cooled gasolene engines and has already marketed 3,000,000 of these and other engines.

Were there lubrication problems? Of course. "But," says President Don Thomas, "I am happy to say they have continually been taken care of by Cities Service from the very beginning. In these formative years, Cities Service engineers came to our plants and recommended the proper lubricants for both our production machinery and the products we make. Thus, for the past eight years, we've used Cities Service Chillo Cutting Oils, Trojan Greases and Pacemaker Oils with complete satisfaction. We don't hesitate to say that the cooperation and outstanding service offered by Cities Service plus the quality of its products has played a major role in helping us build the Clinton Machine Company."

Time and again manufacturers like Clinton report unusual results using Cities Service Lubricants. Find out why. *You* may profit, too. Talk with your local Cities Service Lubrication Engineer or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

MICROHONING*

Generates . . .

ACCURATE, ROUND, STRAIGHT SURFACES

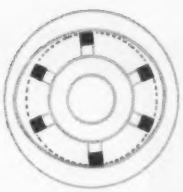
Truly round, straight surfaces are generated by the application of fundamental principles on which the Microhoning process and equipment design are based:

The combined reciprocating and rotating motion of the tool act on the full length of the bore on every stroke.

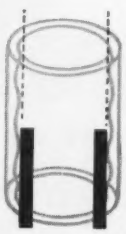
The self-dressing abrasive assures sharp grits and cutting at all times.

The tool and bore automatically align themselves.

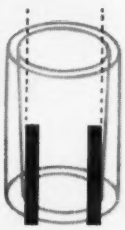
The feed-out of the tool is positive with equal pressure in all directions from the center line.



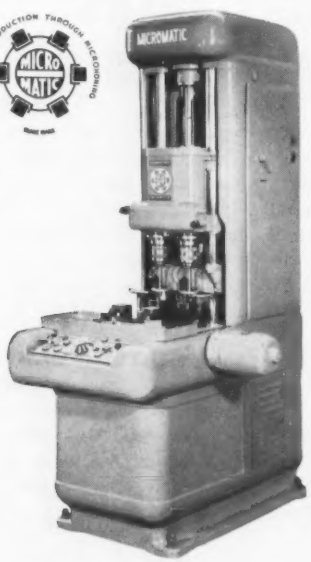
All out-of-roundness is removed by the expanding abrasive "cylinder" formed by the rotating tool. Only the tight areas are abraded until all areas have the same radius from the axis.



Wavy or snaky surfaces are made straight by the long abrasive sticks shearing off the crests of the waves.



In tapered bores the abrasives cut only in the tight area until the cylinder has the same diameter throughout its full length.



ACTUATING LEVER

Steel Forging • 58 to 60 Rockwell "C"

Bore out-of-round and tapered .0015 to .0025 inch.

Microhoning reduces error to less than .00015 inch

Removing approx. .005 inch stock

Production—130 pieces per hour

Machine—Model 705-2 Hydrohoner

***MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish**

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

STANOIL *Industrial Oil tough performer in delicate operation*

A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off for them.

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

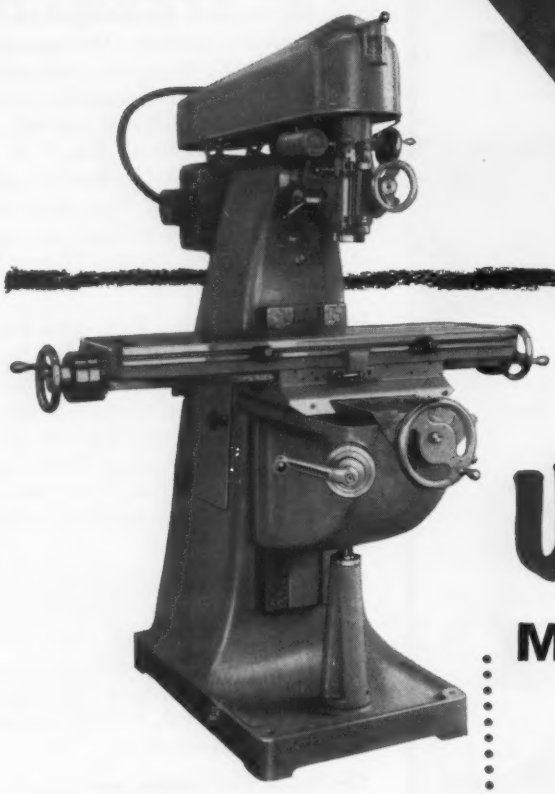
With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)

Choice of hand or
power feed head and table



BALANCED RIGIDITY

assures
*CERTIFIED
ACCURACY

in the NEW

U.S.Vertical
MILLING MACHINE

Balanced rigidity, the key to accuracy for vertical and angular milling operations, is an integral part of the new U. S. Vertical Milling Machine.

These U. S. Vertical features provide rigidity for close tolerance work:

- Machine weighs 2000 pounds
- Extra wide bearing surfaces
- Motor mounted behind column, balances weight of head, resists vibration and deflection
- Major castings are internally ribbed, normalized, stress relieved, and internally braced
- Dovetails are deep and hand scraped
- Massive knee, saddle and table

Drive by B section V belt

***Tested 10 Ways!**

The accuracy of each U. S. Vertical Milling Machine is certified. A check sheet accompanies every machine listing 10 exacting operational tests the machine has passed. The check shows allowable tolerances and actual measured tolerances of the individual unit. A new bulletin provides complete specifications and illustrates various accessories available on the new U. S. Vertical Milling Machine. Write for your *FREE* copy today.

U ★ S ★ Burke
MACHINE TOOL DIVISION

17 Brotherton Road
Cincinnati 27, Ohio

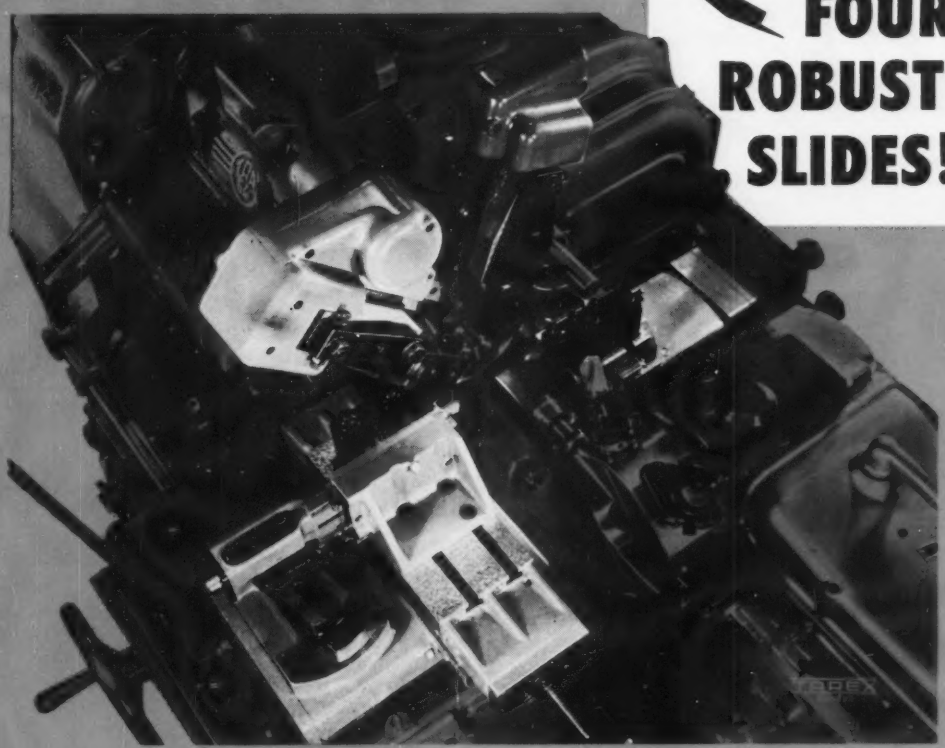
Manufacturers of:
Burke Bench Mills, U. S. No. 1 Milling Machine and the radically new U. S. Quartet

TAREX

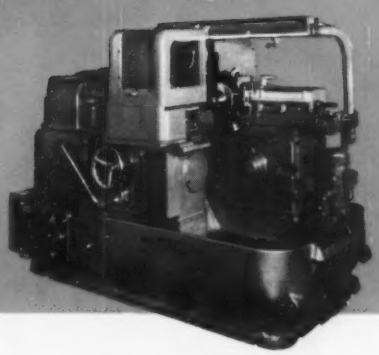
AUTOMATICS

. . . here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

FOUR ROBUST SLIDES!



The front and rear slides mounted on crossed ways, *permitting radial or lateral movements, or combined to produce tapers or irregular forms.* This allows the use of single point tools in many cases in place of form tools with their inherent side thrust. All tool slides actuated by camming systems having adjustable ratios. (The two upper slides are radial only). Machine throughout is engineered to take American-made tools!



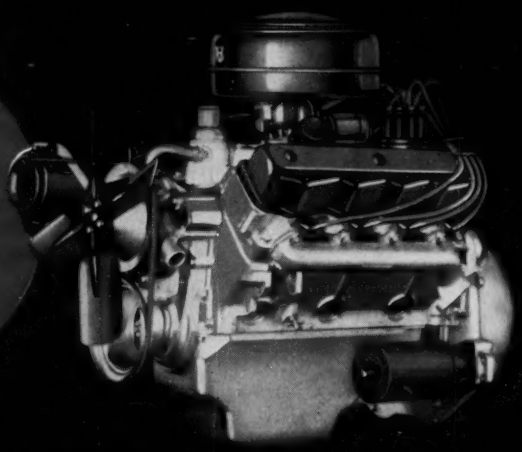
COMPLETE TOOLING and SERVICE in AMERICA.

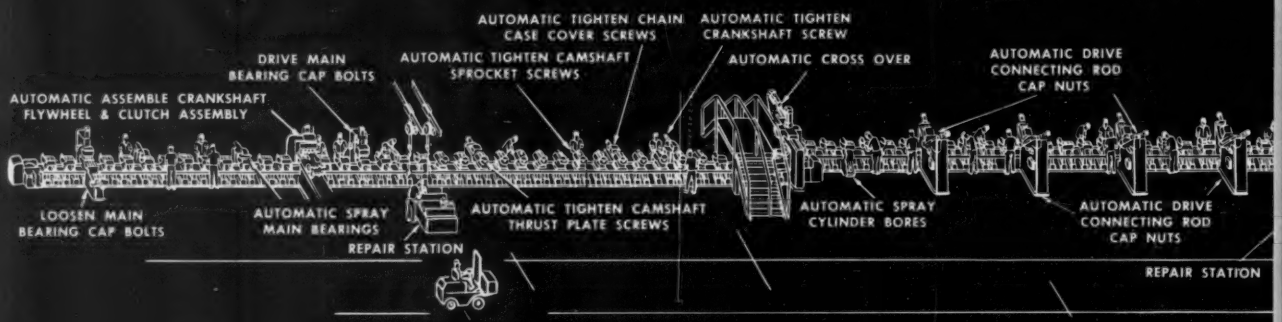
RUSSELL, HOLBROOK & HENDERSON, INC.

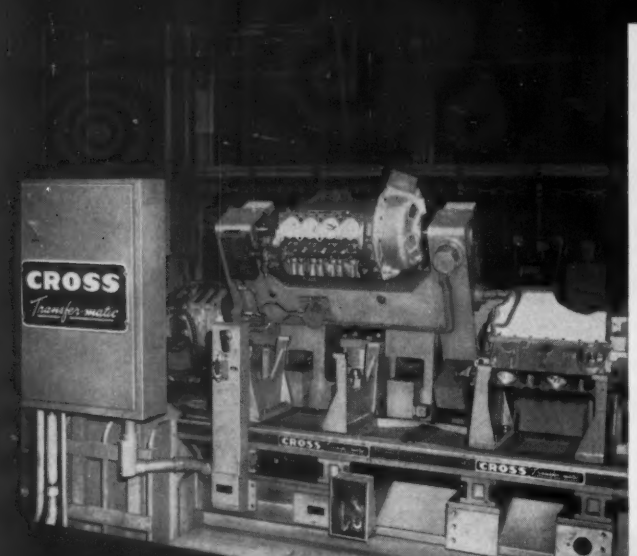
292 Madison Avenue, New York 17, N. Y.

Another Automation First by Cross

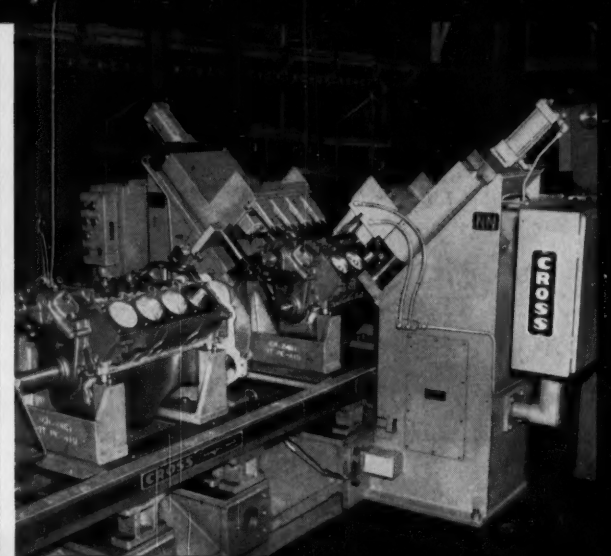
Automation for Car Engine Assembly!




AUTOMATIC ASSEMBLE CRANKSHAFT FLYWHEEL & CLUTCH ASSEMBLY
DRIVE MAIN BEARING CAP BOLTS
AUTOMATIC TIGHTEN CAMSHAFT SPROCKET SCREWS
AUTOMATIC TIGHTEN CHAIN CASE COVER SCREWS
AUTOMATIC TIGHTEN CRANKSHAFT SCREW
AUTOMATIC CROSS OVER
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
LOOSEN MAIN BEARING CAP BOLTS
AUTOMATIC SPRAY MAIN BEARINGS
REPAIR STATION
AUTOMATIC TIGHTEN CAMSHAFT THRUST PLATE SCREWS
AUTOMATIC SPRAY CYLINDER BORES
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
REPAIR STATION

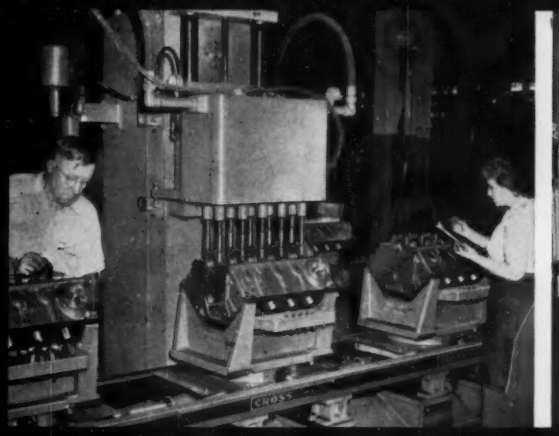


Section II, Station 44: engine is transferred to Section III, Station 1, and placed in car position.

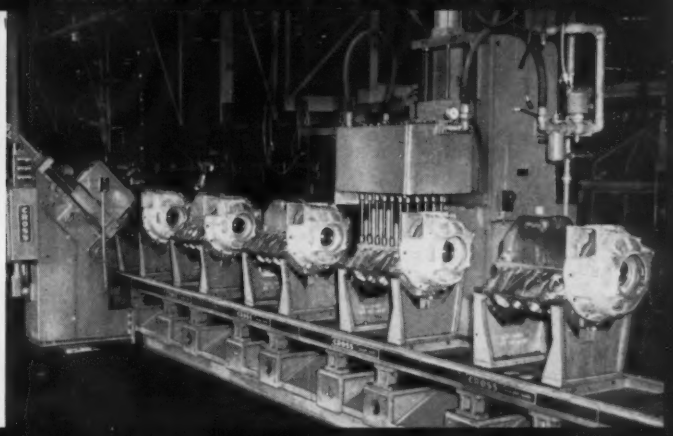


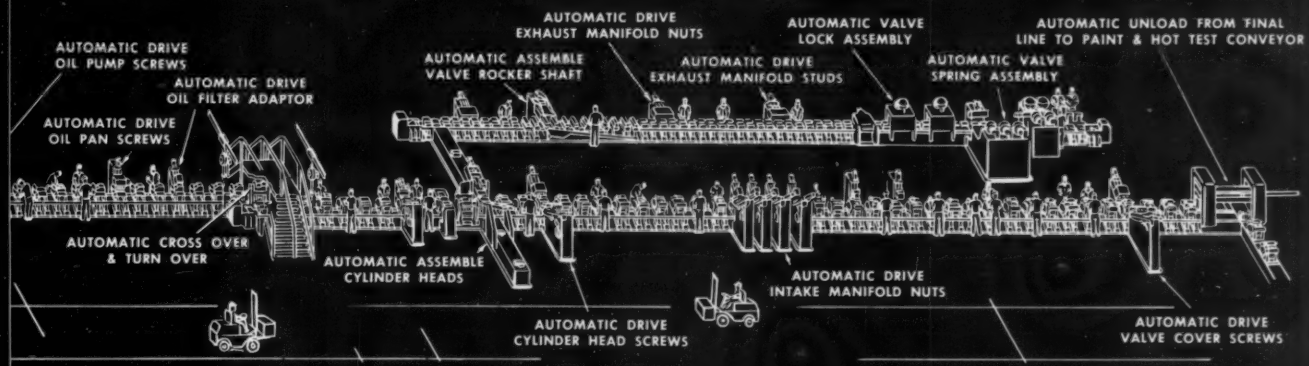
Section III, Station 3: oil is automatically applied to cylinders and valve lifter holes.

Section I, Station 3: bearing cap bolts are automatically loosened ready for crankshaft assembly.



Section II, Station 37: pan screws are automatically tightened, Station 40: oil filter adapter is assembled.




AUTOMATIC DRIVE OIL PUMP SCREWS
AUTOMATIC DRIVE OIL FILTER ADAPTOR
AUTOMATIC DRIVE OIL PAN SCREWS
AUTOMATIC CROSS OVER & TURN OVER
AUTOMATIC ASSEMBLE CYLINDER HEADS
AUTOMATIC DRIVE CYLINDER HEAD SCREWS
AUTOMATIC ASSEMBLE VALVE ROCKER SHAFT
AUTOMATIC DRIVE EXHAUST MANIFOLD NUTS
AUTOMATIC DRIVE EXHAUST MANIFOLD STUDS
AUTOMATIC DRIVE INTAKE MANIFOLD NUTS
AUTOMATIC VALVE LOCK ASSEMBLY
AUTOMATIC VALVE SPRING ASSEMBLY
AUTOMATIC UNLOAD FROM FINAL LINE TO PAINT & HOT TEST CONVEYOR
AUTOMATIC DRIVE VALVE COVER SCREWS

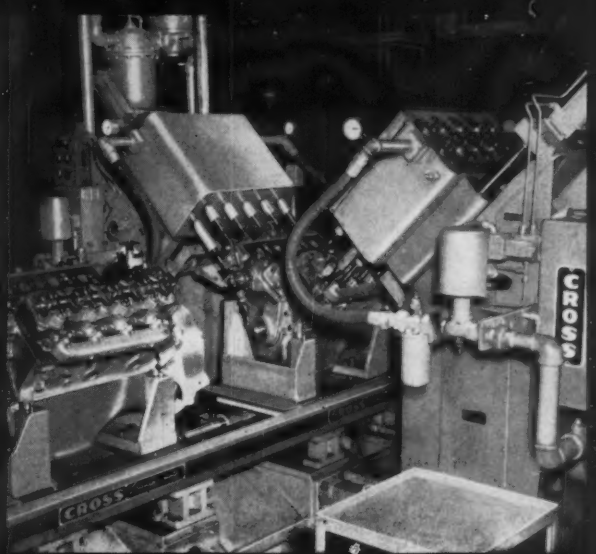
This production line for assembling V-8 car engines consists of three Transfer-matics with a total length of 812 feet. One assembles the engine; the other two (only one shown) assemble the cylinder heads. Operations start at three points with the block and head castings. They are automatically transferred through 198 stations as parts and sub-assemblies are added until the engine is completed and ready for testing.

The rated capacity is 150 engines per hour.

The engine assembly Transfer-matic is sectionized, a feature originated by Cross to reduce downtime. Three sections are provided to permit stopping some operations without interrupting the others.

Modular unit construction provides flexibility for engine changes and for adding new automatic assembly devices of the future.

Like other Cross machines, all parts—even tooling details—are made to interchangeable tolerances for fast, easy maintenance. Other features include construction to JIC standards and automatic lubrication.



Section III, Station 15: cylinder head bolts are tightened to a pre-determined torque.

Established 1898

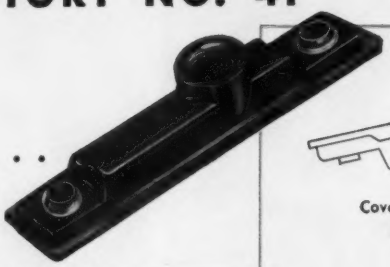
THE CROSS CO.

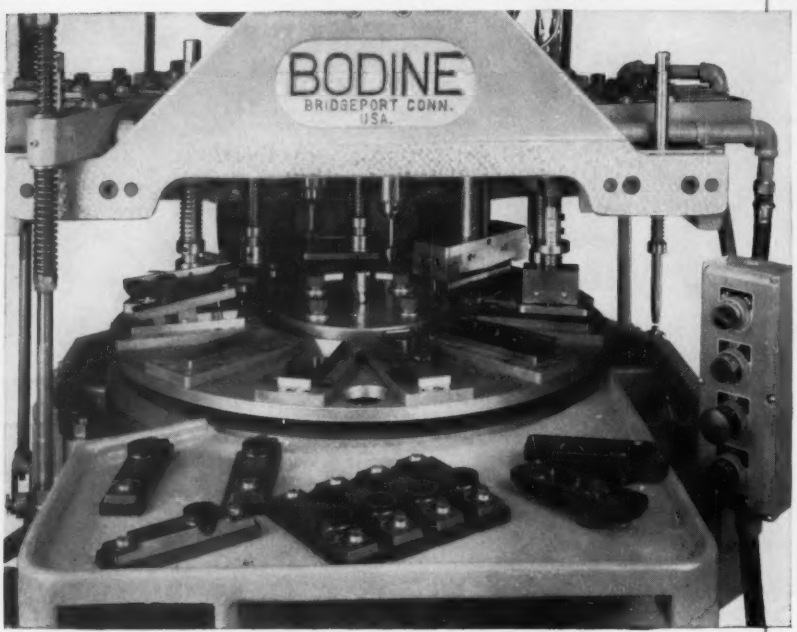
First in Automation

DETROIT 7, MICHIGAN

Bodine CASE HISTORY NO. 41

MULTIPLE OPERATIONS . . .
MULTIPLE TOOLING . . .
METAL AND PLASTIC . . .
ON ONE VERSATILE MACHINE

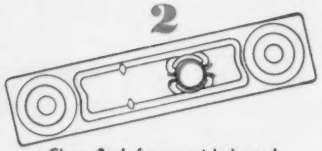




1

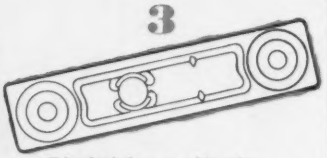
Covers hand-loaded, one piece per stroke.

2



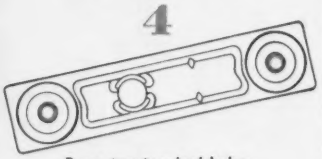
Clean flash from vent hole and slots. Carbide tools.

3



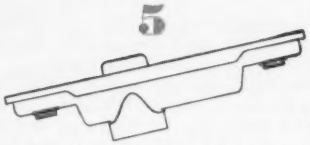
Trim flash from outside edges of cover. Carbide tools.

4



Ream two terminal holes in lead inserts.

5



Hollow-mill two terminals in lead inserts . . . using inverted spindles.

6

AUTO EJECT.

The unusual features of this Bodine tooling lie in the many different types of operations performed in one high-speed cycle, and also in the multiple tooling of the machine to handle many different sizes of these auto battery cell covers, both 6-volt and 12-volt.

Major battery producers now use 15 of these production units. Bodine basic design, as will be seen in the photograph, provides ample room for inclusion of the dies required for trimming operations, as well as the rotary spindles.

PRODUCTION: 1,250 covers per 50-minute hour . . . with machine operating at 25 strokes per minute.

If you are looking for increased output at lower cost, without sacrifice of quality . . . on assembly or production operations, or a combination of both . . . talk to Bodine first. Our experience can save you money and costly engineering.

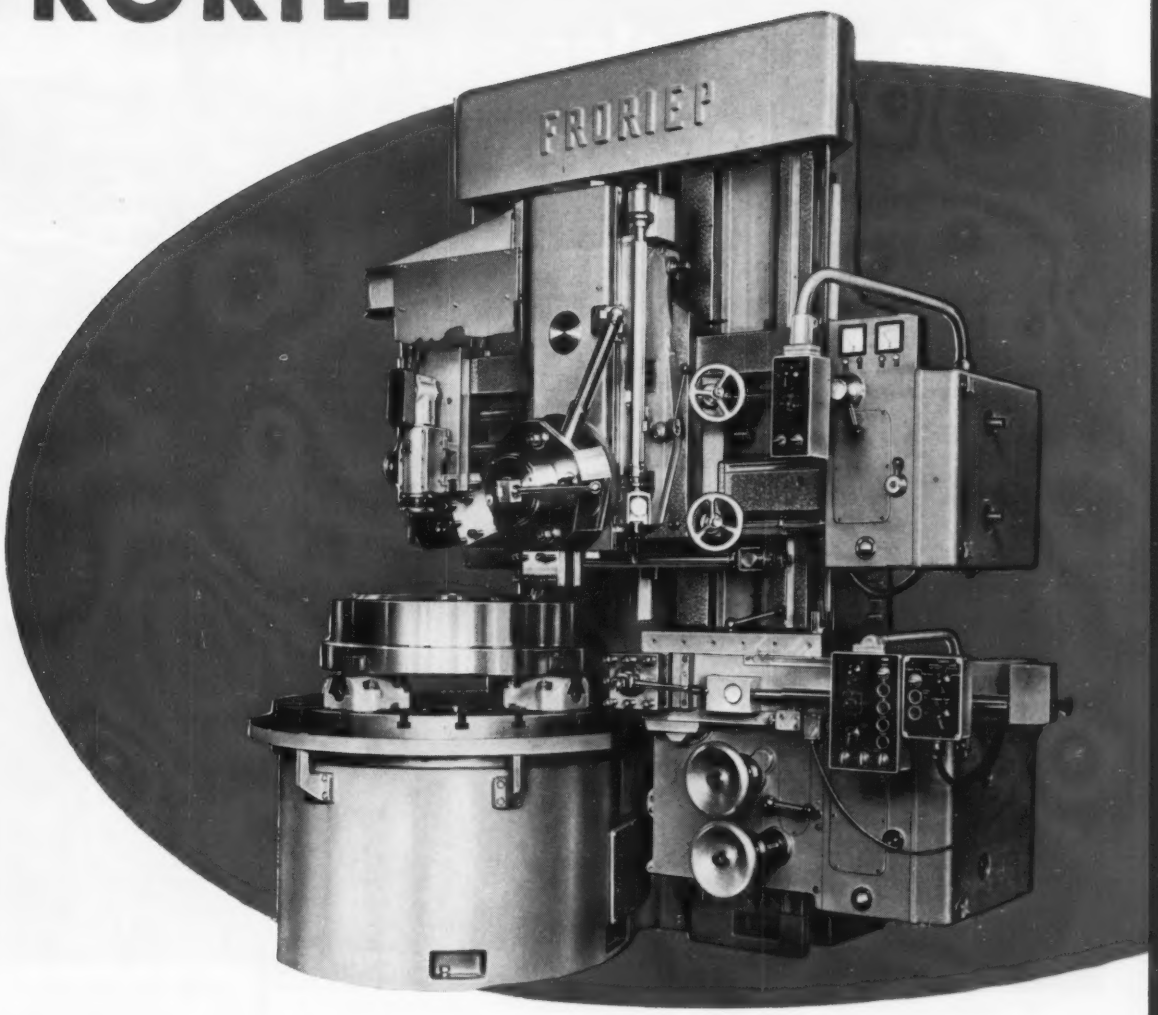
Write Dept. M-4.

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

7BD55

For more information fill in page number on Inquiry Card, on page 257

FRORIEP



PUSH-BUTTON CONTROL CUTS "DOWN-TIME" ON VERTICAL TURRET LATHE

Buttons and switches — on conveniently placed pendants — control table speeds, feeds, and rapid traverse.

Speeds can be changed during cut—automatically, if desired.

By the use of tripping devices, diameters and depths can be repeated within set limits. Only finest adjustments need be made by hand. Feeds may be pre-selected.

Automatic copying attachment with electric tracer.

Four heavy-duty sizes: 40″, 49″, 55″, and 63″ tables. Each has 18 table speeds—side heads and vertical heads have 12 feeds each.

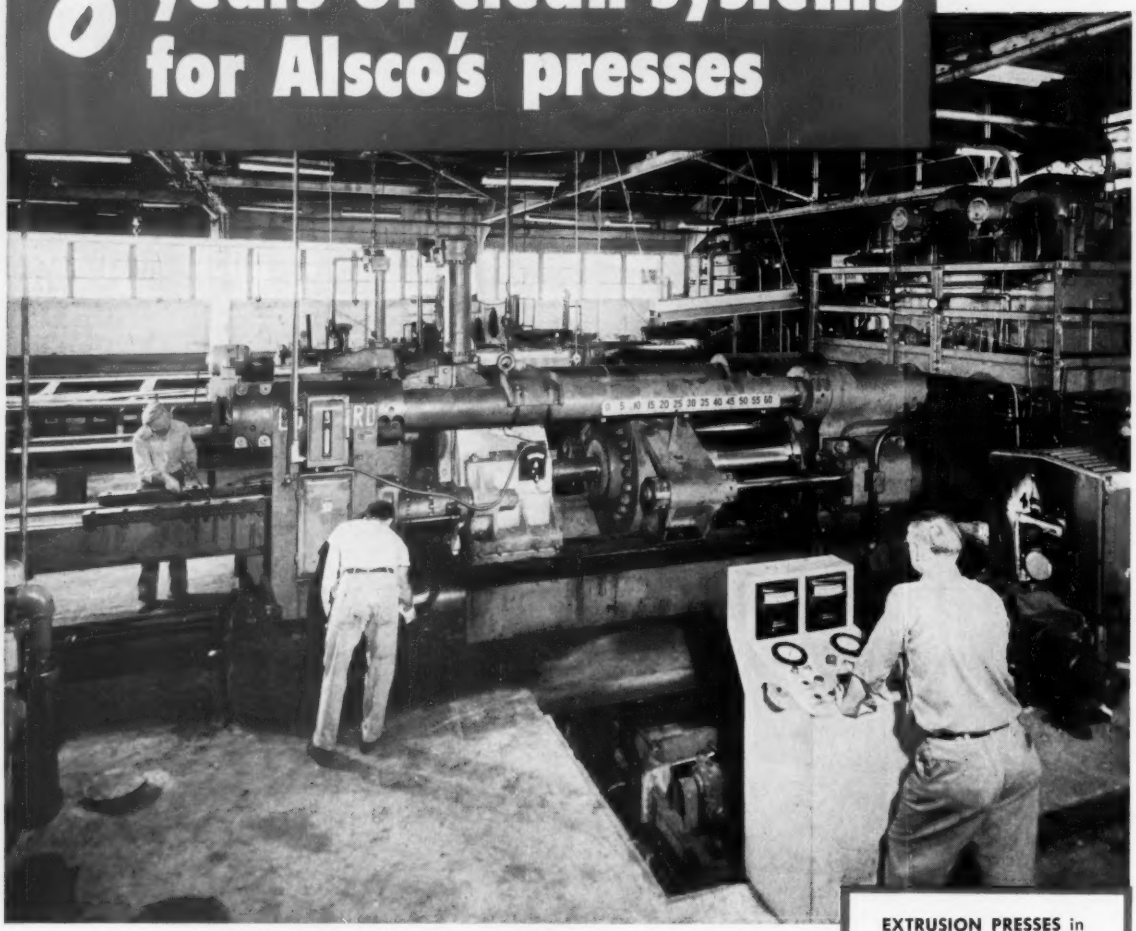
Prompt service and spare parts as close as your telephone.
Froriep Machine Service Corp.
Chrysler Building, N. Y.
ORegon 9-3560

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

For more information fill in page number on Inquiry Card, on page 257

8 years of clean systems for Alsco's presses



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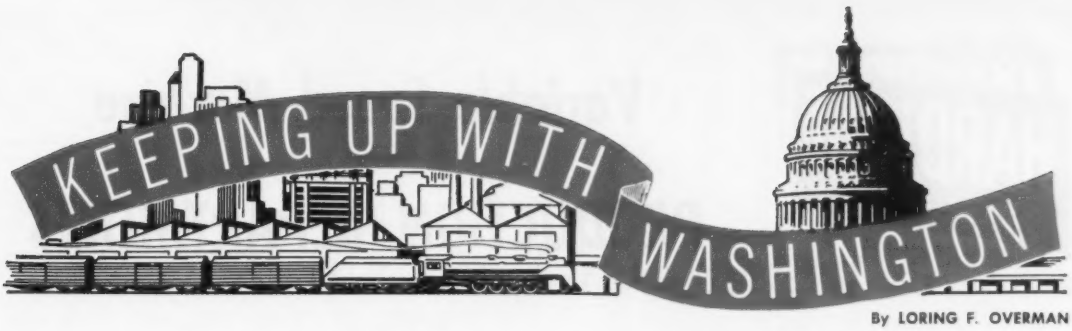

By LORING F. OVERMAN

Government Problems in an Election Year

Whether the United States is still the No. 1 military power was the question which had Washington in an uproar as winter eased into spring. An Assistant Air Secretary for Research and Development resigned to express "an honest difference of opinion between himself and his superior." The Senate Armed Services Committee scheduled hearings to inquire into the status of the weapons program. Washington politicians and military planners wrestled with the disturbing enigmas of war and peace, politics and preparedness, budget-balancing and international risks. This being an election year—one in which every move in Washington is evaluated for its political implications—clear-cut answers are not to be expected to any problem which may border on the controversial.

Operation Defense

The principal cause of friction in our defense plans is the "hassle" over whether the budget-balancing program is putting the United States far behind in its development of modern weapons. Under discussion are programs relating to a medium-range (1500-mile) ballistic missile, and a so-called "ultimate weapon," the ICBM (intercontinental ballistic missile).

Trevor Gardner, the Assistant Air Secretary for Research and Development who resigned, explained his action: "During the past three years I have continuously striven for a larger budget for the Air Force research and development program. I am concerned about the rate of our technological progress relative to a potential enemy or group of enemies." Prior to hearings on the subject, half a dozen Senators had expressed themselves as favoring a "crash program" which would put American industry and aviation into an accelerated effort to wipe out any vestige of doubt as to the position of this nation in any arms race.

Operation Machine Tools

Pending clarification of military needs, the machine tool program is again on a new tangent. Newest plan calls for "trigger" contracts for machine tools. These would become effective automatically in the event of certain stated-in-advance emergency conditions. An official release of the Business and Defense Services Administration says: "Pointing out a basic difference between the contemplated Pool Order Program and the 'Phantom Order' program administered under the NSRB (National Security Resources Board), Fred W. Huston (General Services Administration) stated that an order received under the latter program became the basis for an agreement to make a contract, provided authority existed at the time the need arose, whereas a 'trigger' contract constituted an actual legal agreement committing both parties to proceed in a certain way in the event of an emergency. Also, the latter can be certified under existing borrowing authority provided in the Defense Production Act as a valid basis for a loan."

Details of the program are being worked out by industry representatives, in cooperation with Fred W. Huston, Philip Jordan, and Joseph E. Moody of the General Services Administration, and Jonathan Rintels, who represents the general council of BSDA. This team is now working on schedules of tools to be subject to trigger contracts, and names of interested manufacturers.

Operation Shekels

In anticipation of nobody knows what, Washington has also made emergency plans for that most important production tool—money. In Defense Mobilization Order 1-20, the Federal Reserve Board is directed to develop preparedness measures "relating to monetary and bank credit policies." The FRB is also to develop stand-by credit controls for use during "various types of mobilization emergencies." First assignment of FRB is the "preparation of plans for maintenance of the monetary system, including the availability of deposit money, the issuance of currency, and the provision for bank credit, under conditions of attack."

Operation Small Business

Speaking for the Navy Bureau of Ships, A. J. Weisbecker, head of the industrial tool and equipment branch, observed that most of the Bureau's machine tools, located in twelve Naval yards and facilities, predate the "Carbide Age." They are now considerably below present standards for modern machines. Citing vertical turret lathes as an example, Mr. Weisbecker estimated that thirty-four modern machines would have the same productive capacity as the Bureau's present 117. He also believed that the new machines would save $740,000 a year in operating costs. At this rate, he said, the 117 machines could be replaced and paid for in two years.

A survey by the Bureau of Ships, according to Mr. Weisbecker, showed that 2474 modern machine tools would replace 3495 existing obsolete machines, at a cost of approximately $72,000,000. On the basis of peacetime requirements, it was recommended that 823 modern tools replace 1218 of the obsolete units most currently operated, at a cost of approximately $14,000,000. Mr. Weisbecker estimated that replacement of the entire lot would be amortized in less than five years, providing annual savings of 3090 man-years and 74,480 square feet of floor space.

In pointing out the money-saving possibilities of modern machine tools, other representatives of the Defense Department emphasized the need for continual study of the problem, with contingency funds available to acquire new machines whenever needed. Dudley Sharp, Assistant Secretary of the Air Force (Materiel), indicated that the Defense Department may again ask Congress for an annual contingency fund of at least $100,000,000 to purchase machine tools. Such a request would reinstate one phase of the so-called Vance plan, which was abandoned on February 6 in favor of a production readiness policy. The other discontinued phase of the Vance program was a compulsory layaway feature. The production readiness policy, according to Dudley Sharp, is based on the premise that the decisive phase of any next war would be relatively short, and the means for carrying out production assignments must be in hand or available promptly.

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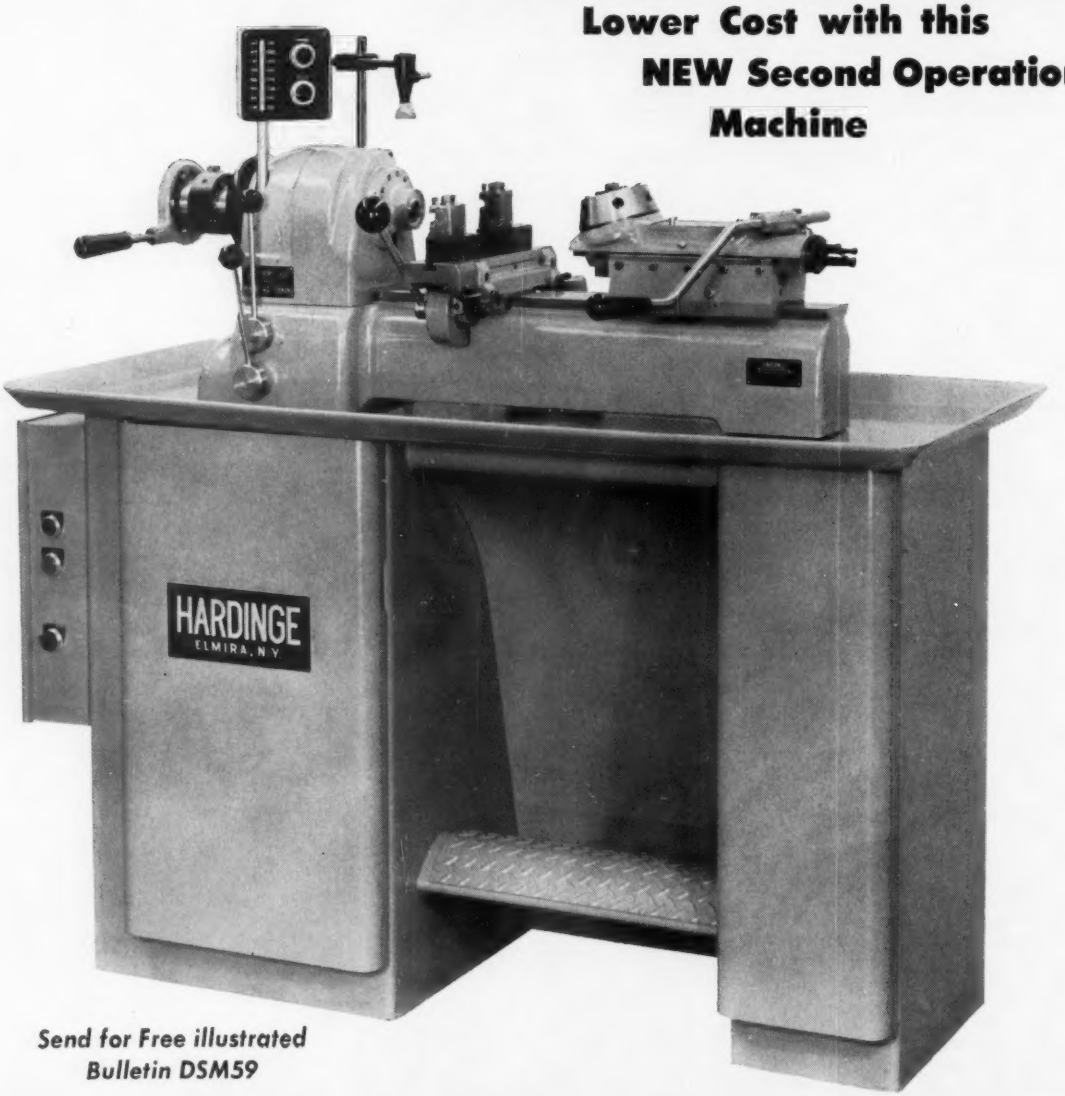

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MACHINERY
APRIL 1956

Why Doesn't the Government Cut This Waste?

TEN months have elapsed since the Second Hoover Commission made its report concerning proposed reforms in Government operations that could save taxpayers over five billion dollars each year. Yet, actual implementation of the suggestions by the Administration and Congress may be considered almost microscopic!

Efficiency and economy in Government underlie all of the Hoover Commission recommendations. Savings would be effected by eliminating waste, cutting non-essentials, and dropping activities that are outside the Federal Government's proper sphere. The Commission made a total of 314 recommendations, of which about 140 require legislative action. Of the latter, there are 52 recommendations requiring legislative action for which no bills have even been introduced in Congress. And of those introduced, only eleven minor recommendations have been enacted into laws.

It is equally discomfiting to ponder on the fact that the Administration has acted on only 36 of the recommendations that do not require legislative action—and those have been mostly minor. Why this lethargy when the Commission was bipartisan in make-up so that political expediences should not be considerations? Are our lawmakers and Government Administrators uninterested in lowering the taxation burden and in decreasing the National debt?

There can be little argument against the practicality of the Hoover Commission recommendations. Proposed reforms have been outlined in great detail and very few exceptions have been taken in public to the suggestions. It would seem that there must be opposition behind the scenes, preventing wholehearted support for the suggestions that do not require the enactment of new laws. Objections should be brought out into the open—no Government department should consider itself sacrosanct on matters of economy.

The United States Chamber of Commerce is planning to hold local, state, and regional meetings in the effort to mobilize citizen support for the Hoover Commission recommendations, because it appears that many of them will die unheeded unless a grass-roots movement is initiated that will rouse Congressmen, Senators, and Federal department heads from their lassitude.

A good plan to foster such a movement would be for individual business leaders and other citizens to personally suggest to the editors of their local newspapers that editorials be printed urging voters to write letters to their representatives in Congress. If thousands of editorials appeared at about the same time in local newspapers, the cumulative effect would be far more powerful than the few sporadic editorials that have been presented by a number of big-city daily newspapers.

Five billion dollars are not peanuts! Every taxpayer has a right to know why they are not being saved.

Charles O. Herb

EDITOR

what's new

IN STAINLESS STEEL FROM STOCK

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Stainless Pipe for Welding Applications: Now there's no need to wait for mill deliveries or to use expensive stabilized types when you want stainless pipe suitable for welding. Type 304L pipe, an extra low carbon type that eliminates the need for stress relieving after welding, has recently been added to Ryerson stocks. Size range: Schedule 40 welded pipe in commonly used sizes from ¼″ through 2″. Schedule 40 seamless in 3″, 4″ and 6″ pipe sizes.

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MACHINERY
Vol. 62 No. 8
APRIL 1956

"Frictionless" Design with Ball Bearing Screws and Splines

Higher efficiencies, less wear, and reduced torque requirements are obtained with practically frictionless rolling balls used between mating surfaces. Interesting applications of ball bearing screws and splines to machine tools are illustrated and described

By DAVID A. GALONSKA, Senior Project Engineer
Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Mich.

REDUCTION of friction has always been a principal aim of machine designers and tool engineers. One positive method of accomplishing this is the substitution of rolling contact between two parts for sliding-surface contact. The importance and success of rolling contact are exemplified by the widespread use of anti-friction bearings in today's machines, mechanisms, and other equipment.

While applications and advantages of anti-friction bearings are well known, relatively little information has been published in the technical press about the use of balls for splines and screw and nut assemblies. In the ball bearing screw assembly developed by the Saginaw Steering Gear Division of General Motors Corporation, both the screw and mating nut have a specially formed, concave, helical ball race, as seen in Fig. 1. Within the nut, the entire length of its race is filled with steel balls. The nut is fitted with a tubular ball guide which interrupts the path of the balls, deflects them from the helical race on the screw,

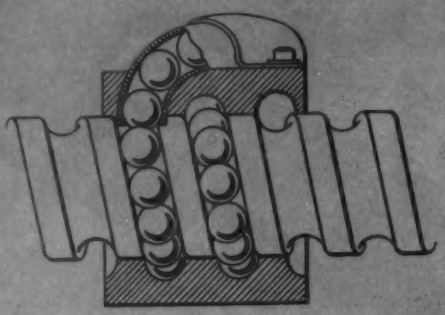


Fig. 1. (Left) In ball bearing screw and nut assemblies, rolling balls recirculate continuously in a closed circuit as the screw and nut rotate

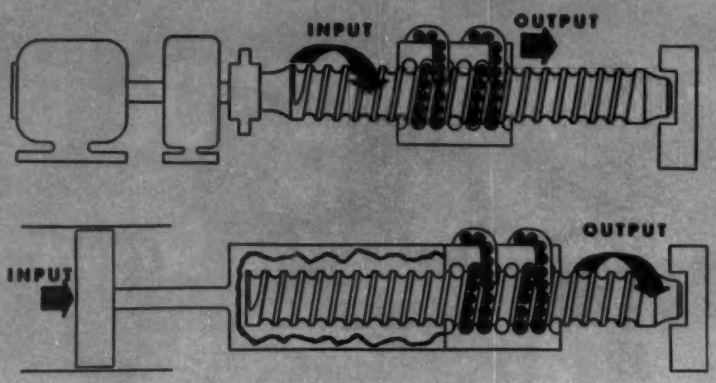


Fig. 2. (Right) Schematic drawings showing how rotary motion can be changed to linear motion (top), as well as converting linear to rotary motion (bottom)

guides them diagonally across the outside of the nut, and leads them back again into the raceway. To permit carrying higher loads in a minimum of space, assemblies can be provided with multiple circuits, as illustrated by the three-circuit unit seen at the top in the heading illustration.

In both single- and multiple-circuit designs, the rolling balls, acting as the medium of engagement between screw and nut, recirculate continuously in a closed circuit as the screw and nut are rotated relative to each other. Rotary motion can be changed to linear motion with minimum frictional loss, as shown at the top in Fig. 2. Here, rotary motion is applied to the screw through a motor-driven gear-box, and the ball nut is driven along the longitudinal axis of the screw. Also, rotary motion can be applied to the ball nut through a gear or some other similar means to move the screw along the longitudinal axis of the assembly.

It is just as practical to convert linear motion to rotary, as illustrated at the bottom in Fig. 2. With a thrust load applied to the ball nut by an air or hydraulic cylinder, linear motion imparted to the ball nut is translated into rotary motion of the screw. Conversely, when a thrust load is applied to the screw, the linear motion imparted to the screw will produce rotary motion of the ball nut.

Saginaw ball bearing screw and nut assemblies offer a minimum operating efficiency of 90 per cent, thus substantially reducing torque requirements. For example, a conventional screw and nut having an Acme thread with a lead of 1/4 inch, a diameter of 1 1/2 inches, and a helix angle of about 3 degrees would require 120 foot-pounds of effort to raise a 10,000 pound weight, based on an unusually high efficiency of 30 per cent. A ball bearing screw and nut assembly could lift the same weight with only 40 foot-pounds of effort. Also, because friction is reduced so effectively, there is less wear and negligible heat generation. The reduced torque requirements permit using smaller operating motors, resulting in more compact installations.

Saginaw produces ball bearing screw assemblies in both custom and standard types. In the custom type, the nut and screw are precision ground. Standard assemblies have a rolled screw thread and tapped nut; a rolled thread, heat-treated screw, and a tapped nut; or a rolled thread, heat-treated screw, and a ground nut. Space and weight requirements, expected life, and cost dictate the selection of a particular type.

Loads up to 170 tons have been handled with ball type screws and nuts. Such assemblies have been made with screw diameters up to 6 inches, and lengths to 40 feet. On the other hand, screws with ball track diameters as small as 1/4 inch, and only 1 1/2 inches long, have been used to advantage. Such assemblies are produced for balls varying from 1/16 to 13/16 inches in diameter. Lubrication is recommended for most efficient operation.

The original application of the Saginaw ball bearing screw assembly was in the steering mechanisms of passenger cars, trucks, and buses. Its immediate success and dependability convinced engineers that this virtually friction-free principle could be adapted to almost unlimited applications in many widely different fields. Some of the present applications are found in the actuation of landing gears and control surfaces on aircraft and guided missiles, machine tools, welders, and the automobile bumper jack.

In the machine tool industry, ball bearing screws are being applied for various purposes where easy, sensitive movement of heavy loads is required. One example is their use for the tool-slides on Niles 52-inch, railroad car-wheel lathes. The arrangement of one of the slide assemblies is shown in Fig. 3. Screw *A* has an outside diameter of approximately 1 3/4 inches, and a left-hand ball race thread with a pitch of 0.265 inch. This screw is mounted between spherically seated, anti-friction thrust washers *B* and *C* in the slide base casting. Nut *D* is arranged to pivot in its housing for self-alignment.

Another application of ball bearing screw and nut assemblies is for both the saddle and table movements on Cincinnati Contourmaster tool and die milling machines. These machines are designed for accurate duplication of shaped contours, and the reproduction of intricate detail dies, molds, and hobs. Although hand operated, the machines have an automatic, hydraulic depth-control tracer mechanism to provide precise duplication of master shapes. The machines are available in two styles: one having a 16-inch table travel and equipped with standard Acme thread lead-screws for both saddle and table movements; and the other, with a 22-inch table travel, is provided with ball bearing lead-screws and nuts.

Because of this smooth, effortless operation of both table and saddle movements, the ball bearing type machines are greatly in demand. In addition to practically eliminating any degree of physical effort in machine operation, the almost frictionless contact between lead-screws and nuts provides the operator with a delicate "feel" of the cutter action. A sectional drawing, showing the ball bearing nut and lead-screw for the table of this machine, is presented in Fig. 4. For this particular application, balls 5/32 inch in diameter are recirculated through the nut.

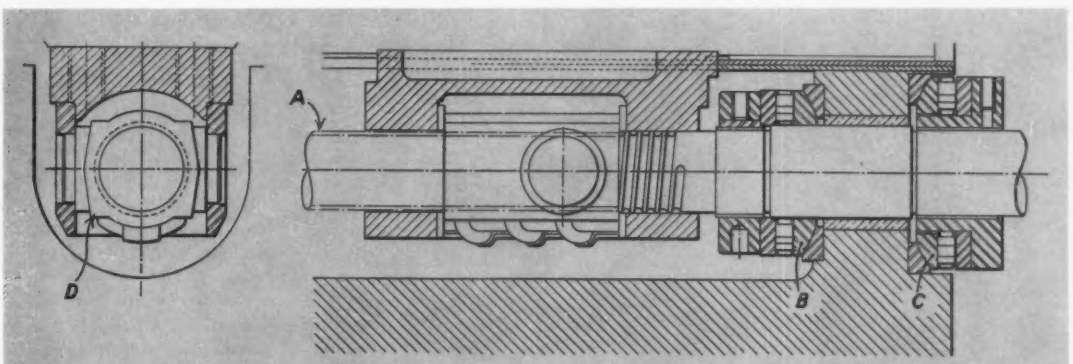


Fig. 3. (Above) Application of ball bearing screw to tool-slide of railroad car-wheel lathe. Nut (D) is arranged to pivot in its housing for self-alignment

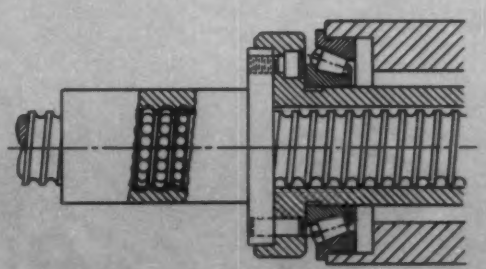


Fig. 4. (Right) Sectional drawing of a ball bearing nut and lead-screw used for the table of a tool and die milling machine to provide smooth operation

An unusual feature of this adaptation is that, under certain cutting conditions, the mechanism works *too* freely. For example, when feeding crosswise, the table would tend to creep, due to the action of the cutter teeth, since there was not enough frictional resistance to prevent the unwanted rotation of the table feed-nut. This situation was overcome—while still retaining effortless operation of the handwheel—by providing spring-loaded, friction brake mechanisms. A separate brake mechanism, which can be engaged whenever it is necessary to apply a small amount of frictional resistance to the system, is furnished for both table and saddle operating controls.

One such brake mechanism is illustrated in Fig. 5. The ball bearing lead-screw *A* for the milling machine table is an extension of the one shown in Fig. 4. Since the ball bearing feed-nut is located near the left-hand end of this screw, it is not visible in Fig. 5. Machine table *B* is fed by rotating handwheel *C*, thus turning shaft *D* and a bevel gear *E* which meshes with a similar gear *F* mounted on the lead-screw.

To apply resistance to table movement, sometimes caused by cutter action, the spring-loaded plunger *G* is brought into contact with a friction plate *H* that is pinned to shaft *D*. This is accomplished with a simple hand-lever *J* having two detented operating positions to simplify engagement or disengagement of the brake. Contact between plunger and friction plate retards lead-screw rotation sufficiently to prevent table creep, but allows rotation by means of the operating handwheel.

Ball bearing splines are a relatively new development, resulting as an outgrowth of the ball bearing screw assembly. In one sense, such units are not really splines, since there are no teeth, keyways, or serrations involved. Instead, bearing balls are continuously recirculated through closed, independent circuits in an outer raceway, as seen at the bottom in the heading illustration. The balls roll in three or more axial raceways, equally spaced about the outer surface of a tubular or solid inner member. A guide on the outer member interrupts the path of the balls. They are deflected from the race, guided through the body, and returned to the race.

The coefficient of friction of ball bearing splines is approximately one-fortieth that of conventional splines. Rolling splines either transmit or restrain exceptionally high torque loads, while still permitting almost friction-free linear move-

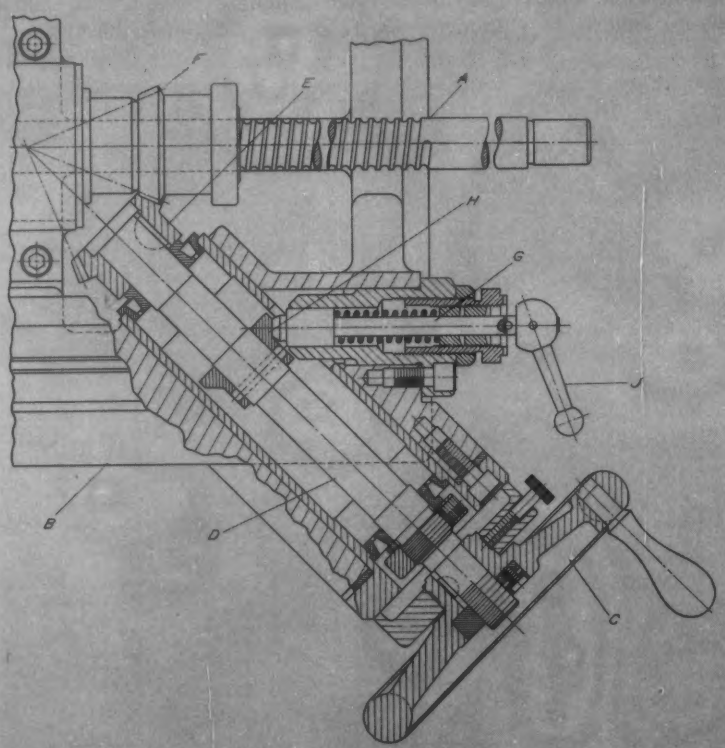


Fig. 5. Spring-loaded, friction brake mechanism for applying slight resistance to table movement caused by action of cutter teeth on milling machine

ment. Also, bending loads can be tolerated. A typical torque restraint application of ball bearing splines is the one in aircraft oleo struts, where easy relative movement of the members is allowed while the assembly is under high torque or bending moment. In torque transmission applications, such as a machine tool spindle feed, linear movement of one member is allowed within another member, while rotating under heavy loads.

Ball bearing splines have been built from 3 to 50 inches long, and 3/8 to 3 inches in diameter. For applications which require the conversion of push-pull motion to rotary motion, splines can be provided with high leads ranging from 20:1 to 100:1. Because of low friction and high efficiency, ball bearing splines will handle the same work loads with only a fraction of the power required for conventional sliding splines, thus saving weight.

One machine tool application designed by Saginaw was for the sliding spindle feed on a radial drilling machine. Here, a conventional sliding spline was subject to high friction forces generated by the torque, which interfered seriously with the free linear movement of the tool. With a ball bearing spline, torque can be transmitted efficiently through any desired velocity range, while permitting steady, smooth linear movement with almost no resistance.

Machining Titanium and Titanium Alloys

TITANIUM is a difficult metal to machine because of its unique chip-forming characteristics. The chips are long, curly, and thin; only slightly thicker than the depth of cut. The cutting forces are lower than those in cutting alloy steel, but titanium chips pass over the cutting tool face so rapidly that these forces are concentrated on a very small area. This results in increased contact pressures which cause high temperatures at the tool tip.

Cool titanium chips are relatively brittle, but when heated during a machining operation, they are so plastic that they will often collapse and pleat under their own weight. In this condition they easily clog tool flutes. At elevated temperatures, titanium is so reactive that it can alloy with and weld to tool faces, particularly when the cut is interrupted, as in milling. These chip-forming characteristics require low speeds to hold down the rate of heat generation. Cutting fluids should be used to dissipate heat and minimize alloying.

Work-hardening that may result from the heat developed in machining this metal is relatively shallow in depth, and there is usually no difficulty in re-starting a cut that has been stopped. Machining titanium also produces an abrasive action on the cutting edges of tools. Tools for cutting titanium must have well-supported cutting edges, and rigid machines and fixtures are required. With high-speed steel tools, cutting speeds can be as high as 50 to 60 surface feet per minute on commercially pure titanium, ranging downward to 10 to 20 surface feet per minute for the manganese-aluminum titanium alloys. Carbide tools can be run two to five times faster, although carbide is not suitable for all types of machining operations on titanium.

The following suggestions for machining titanium and titanium alloys have been made by the National Twist Drill & Tool Company.

Drilling—Short, fluted, heavy-duty drills give longer tool life in operations that permit their use. Fast spiral drills require less torque and thrust but often fail, due to chipping of their weaker cutting edges. An oxide treatment minimizes alloying of the chips to the flutes of the drills.

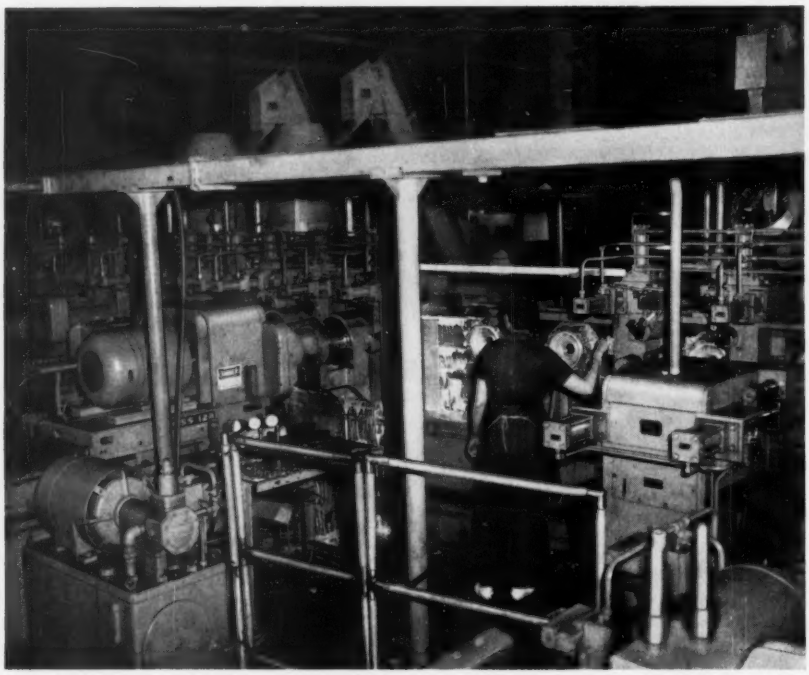
In drilling holes more than one diameter deep, the drill should be withdrawn at least once each one-half diameter of advance to clear and break the chips. Exceptionally deep holes can be produced with this method.

Straight, accurate, deep holes with a good finish can be produced with carbide-tipped tools such as Target and Center-Cut gun drills manufactured by the National Twist Drill & Tool Co. Special carbide grades are required for long tool life.

Reaming—Reamers of regular design with either straight or spiral flutes can be used. Reamer lands should be reduced to approximately 0.005 inch width to minimize pick-up. Chamfer relief should not exceed 5 to 7 degrees or chatter may result.

Milling—Standard design milling cutters can be used on titanium. Coarse tooth cutters may be required to handle the long chips produced in deep cuts. Climb milling is recommended because the cutter leaves the work with a chip that tapers to zero thickness, reducing the tendency of the chip to alloy to the cutter. In conventional milling or face milling, the chip load should be about 0.002 to 0.004 inch per tooth to reduce the alloying action of titanium.

Transfer Machines Boost Output of Hydra-Matics



Comprehensive retooling carried out to produce the redesigned Hydra-Matic automatic transmission includes versatile transfer machines for inspecting and assembling, as well as machining, various components. One unit handles three different parts without changing tooling

By Reuben R. Jensen
Master Mechanic, Detroit Transmission Division
General Motors Corporation, Ypsilanti, Mich.

HYDRA-MATIC automatic transmissions for 1956 Pontiacs, Oldsmobiles, Cadillacs, and other automobiles, as well as G.M.C. trucks, have been completely redesigned to provide smoother, quieter, cooler, and more efficient operation. Sprag clutches, which are smoothly applied and released without grabbing, eliminate the need for periodic band adjustments.

In tooling up the huge Willow Run plant for the production of this new automatic transmission, numerous changes were made in manufacturing methods and equipment. Included are many versatile in-line transfer machines for inspecting and assembling, as well as machining, various Hydra-Matic components. Flexibility of these transfer machines was an important consideration. Several of the units are used for more than one work-piece, and one machine handles similar parts for three different transmission models, without the need for changing the tooling or making any other modifications.

Rear bearing retainers for the Hydra-Matic transmissions are aluminum die-castings varying in length from 5.94 inches for the Pontiac model to 16.870 inches for the Cadillac. Other design modifications include two plain bearings in the

longer Cadillac retainer, and one each in the Pontiac and Oldsmobile parts. Also, the Pontiac and Oldsmobile castings must have speedometer cable holes tapped through them. These holes are located at different angles.

Three Different Parts Handled on One Transfer Machine

In spite of these and other differences, the rear bearing retainers for the three cars are all machined on either of two identical Sundstrand special, nineteen-station, in-line transfer machines. The castings are indexed from station to station along the machines while mounted on individual pallets, such as the one seen in Fig. 1. Empty pallets are returned from the unloading to the loading stations by means of a conveyor traveling at a right angle to the direction of indexing and located at the unloading end of the machines, a similar conveyor at the loading ends, and one of three return conveyors that are all parallel but opposite to the direction of travel through the machines. All of these conveyors are of the continuous chain type.

A total of 25 pallets are provided for each of the three different bearing retainers. When one particular retainer is being processed, the pallets for the other two parts are stored on two of the three parallel return conveyors. The return conveyors and some of the work-holding pallets are visible in the foreground of Fig. 2, and the right-angle connecting conveyor leading from the unloading end of one machine can be seen at the upper right.

Complete control of the automatic cycle is maintained from a push-button, selector switch, and indicator-light console, Fig. 3, located next to the loading station, Fig. 4. By turning a master selector switch, the required machining heads are made either operative or inoperative to suit the particular retainer that is to be processed, and the corresponding pallets for this part are conveyed to the loading station.

Die-castings are manually loaded into the pallets at the first station, as shown in Fig. 4, and power clamped by means of a rack and pinion. Clamping is done against ears cast on the work-pieces to prevent distortion of the surfaces to be machined. The use of pallets allows for greater accuracy, as shot-pins in the locating fixtures provided at subsequent machining, inspecting, and assembling stations enter precisely located holes in the pallets. Each casting is stamped with a number corresponding to the pallet in which it was carried. In this way, improper locating detected in subsequent inspection can be traced to the faulty pallet and necessary corrections made.

To facilitate contact between the operator, maintenance men, tool-setters, and supervisory personnel, an intercommunication system is provided with a receiver and speaker at the loading station and four other locations along the compact installation. Automatic indexing of the loaded pallets is performed by two transfer bars

Fig. 1. Pallet employed to carry die-cast aluminum bearing retainers through a nineteen-station, in-line transfer machine.

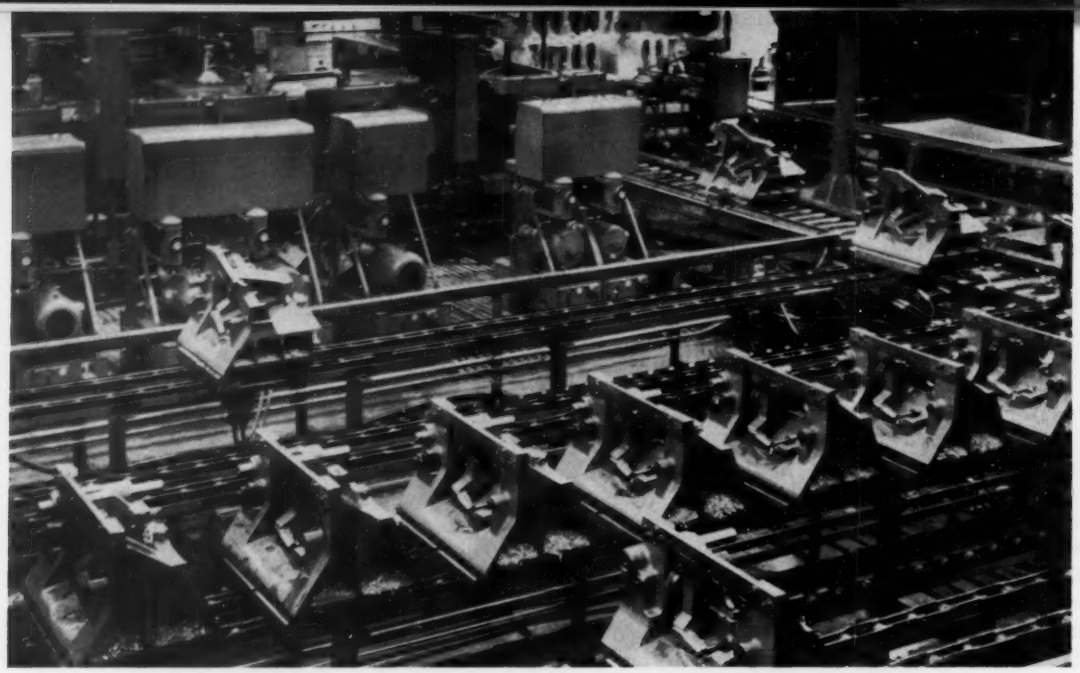


Fig. 2. Parallel conveyors are used to store pallets for bearing retainers not being processed, and to return other pallets to the loading end of the transfer machine.

having pivoting pusher fingers for sliding the pallets along rails.

At the second station, a milling cutter on the left-hand horizontal head rough-faces the flanged ends of all three models of bearing retainers. Tools on the right-hand horizontal head at the same station, rough-bore and chamfer the bushing and oil-seal surfaces in the small diameter end, and face the retainers to length. When Oldsmobile housings are being processed, a vertical angular head at this station is used to drill and spot-face a 1 5/32-inch diameter hole in the casting for attaching the speedometer cable. This hole is reamed and tapped (1 1/4-12 threads) with tools mounted on vertical angular heads at the fifth and sixth stations. Similarly, when Pontiac rear bearing retainers are being fed through the transfer machine, vertical angular heads at Stations 7, 8, and 9 become operative to drill, ream, and tap (15/16-18 threads) the speedometer cable hole, which has a different location and angular position than the hole in the Oldsmobile retainer.

The bores in the small diameter ends of all bearing retainers, in which the bushings are to be pressed, are finished at the third station and

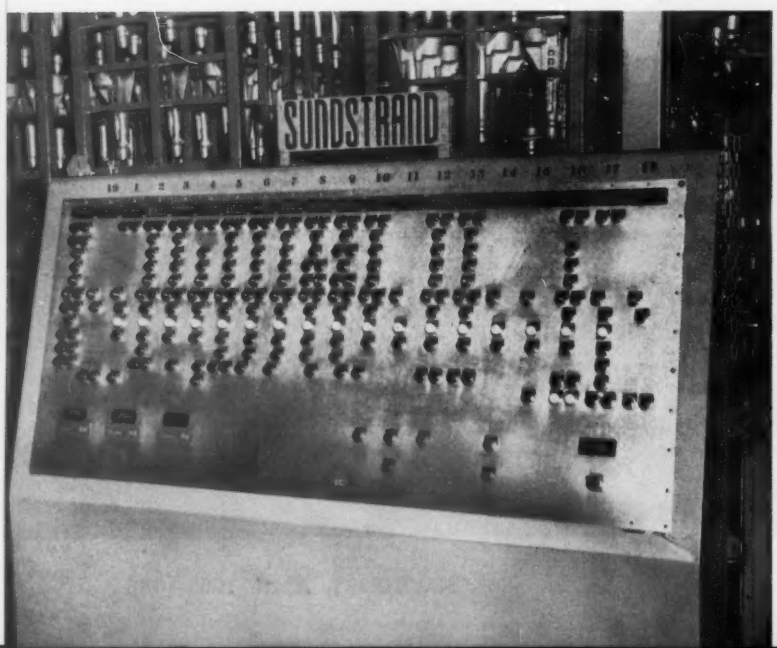


Fig. 3. Console for the transfer machine has selector switches to make required heads operative for the part to be processed.

Fig. 4. Rear bearing retainers are manually loaded and power clamped in pallets at starting end of nineteen-station machine.

inspected by means of an air gage at Station 4. A left-hand head at the fifth station is tooled to rough-bore the flanged ends, and a right-hand head carries a hollow mill for turning a dust shield on the peripheries of Cadillac retainers only. Eight holes are drilled in each flange and the governor boss is spot-faced at Station 6, and two of the holes are reamed and chamfered at the seventh station.

Three hoppers, Fig. 5, are mounted above the eighth and ninth stations to automatically feed bushings into position for pressing them into the bearing retainers. Plungers are employed for pressing the bushings in place, and dies are provided for staking each bushing at two diametrically opposed points. One of the two bushings for each Cadillac retainer is assembled at Station 8 and the other at Station 9, while the single Oldsmobile bushing is pressed into place at the eighth station and the Pontiac at the ninth station. These bushings are finish-bored to a diameter of 1.6875 inches, plus or minus 0.0005 inch, by single-point tools mounted on a double right-hand head at Stations 12 and 13. A double left-hand head at the same stations is used for finish-boring the flange ends.

Flange ends of all bearing retainers are finish-faced at the tenth station, and Stations 11 and 14 are idle. Both the work-pieces and pallets are washed by a soluble oil mixture as they pass through Station 15. Air gages on the left- and right-hand heads at the sixteenth station check both the flange and bushing bores. Completed bearing retainers are automatically unloaded from the pallets at the seventeenth station and deposited on a belt conveyor running parallel to the transfer machine. At Station 18, the empty pallets are picked up by the right-angle chain conveyor and carried by the parallel and second right-angle return conveyors to the nineteenth station at the loading end of the machine.

All heads are fed hydraulically, and chips are removed by an underfloor conveyor extending the entire 69-foot length of the machine. Safe, efficient operation is insured by limit switches, relays, and electrical interlocks which prevent

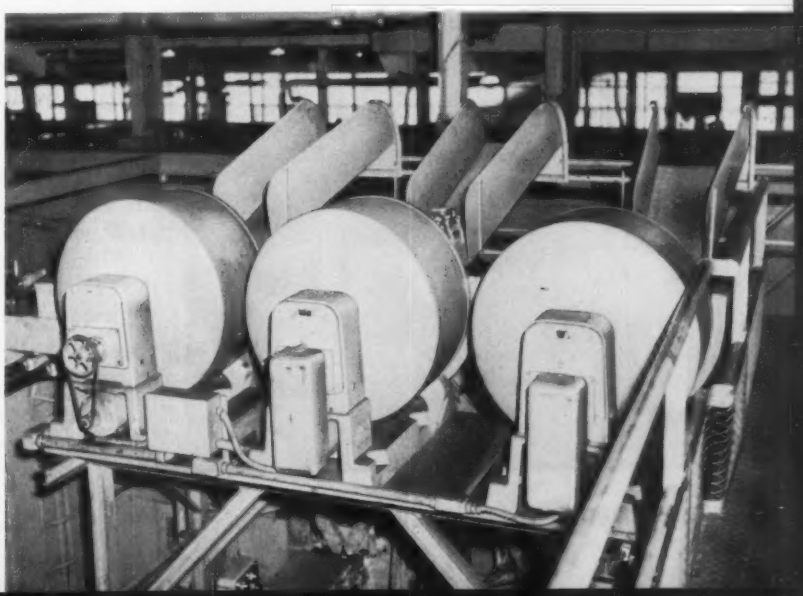
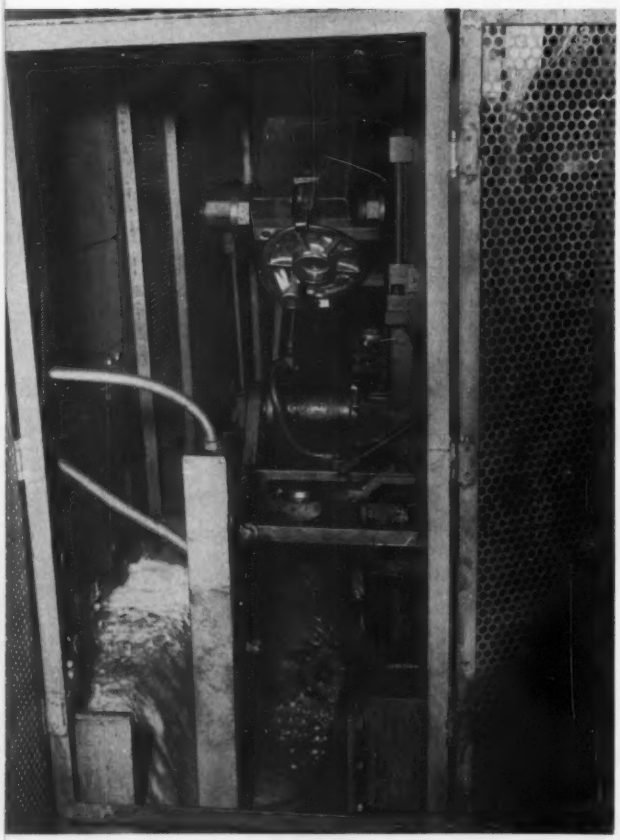


Fig. 5. Bushings are automatically fed into position from these three hoppers for pressing into retainers at Stations 8 and 9.

Fig. 6. Loading end of a two-station transfer grinding machine on which 0.070 inch of stock is ground from casting face in a fourteen-second cycle.



indexing until all other functions of the machine have been completed in the required sequence.

Transfer Grinding an Innovation

Rear pump covers for the Hydra-Matic transmission are iron castings approximately 8 inches in diameter, with a maximum thickness of 2 inches. The main bore of this cover must be machined to a tolerance of plus or minus 0.0004 inch, and its pump mating surface must be held square with the axis within 0.002 inch total indicator reading and flat within 0.0005 inch.

After semi-finish turning and rough-boring on Bullard six-spindle Contin-U-Matics, the castings are manually loaded into a Mercury two-station, transfer grinding machine, Fig. 6. On this machine, up to 0.070 inch of stock is rough- and finish-ground from the pump mating face in a cycle of only fourteen seconds. The cast covers are located from the rough bores and gripped on their peripheries by rotary chucks.

When the covers have been automatically indexed to the roughing and finishing stations, they are rotated and the grinding wheels lowered to

Fig. 7. Cast-iron pump covers are automatically unloaded from the transfer grinder, and placed on the loading end of a thirty-two station machine.

remove the required stock. The grinding wheel spindles are mounted on a unique parallelogram mechanism instead of conventional ways. Automatic control of the work size and compensation for wheel wear are accomplished by means of Sheffield Plunjet air-gaging cartridges. Flatness of the mating surface is held to the specified limits, and the height from this surface to the flange face is maintained within 0.005 inch.

From the unloading station of the transfer grinding machine, Fig. 7, the pump covers are automatically picked up, swung through an angle of 90 degrees in a vertical plane, and placed on the loading end of a special Buhr "Economatic" thirty-two station transfer machine. Provision has been made for alternate hand loading of the machine at the third station, in case the preceding grinding machine is not operating. Stations 2 and 4 are idle.

On this machine—a portion of which can be seen in Fig. 8—a total of fifteen holes in each pump cover are drilled, reamed, spot-faced, countersunk, or chamfered. Also, the covers are rough-bored, and three slots 0.086 inch wide by 5/32 inch deep are milled in each casting. Work-holding fixtures and locators are provided at all stations to insure accurate machining. The diameters of eight of the holes in each pump cover are checked by air gages mounted on the horizontal heads at Stations 7, 15, 20, and 25.

After automatic unloading of the pump covers from the transfer machine, their mating surfaces are lapped on Norton machines, removing from 0.001 to 0.005 inch of stock. Then, the parts are finish-bored to a diameter between 2.4408 and 2.4416 inches on a Heald three-station transfer machine, Fig. 9. Also, on the same machine, this bore is faced, chamfered, and grooved, and a smaller hole 1.561 inches in diameter is bored. As can be seen in the illustration, the covers are automatically indexed from station to station by vertical carrying-arms suspended from an overhead horizontal transfer bar. The arms are swung upward after indexing to clear the machining heads as they advance from the left.

Transfer-matic Completely Machines Two Different Housings

Another example of a special transfer machine designed to handle more than one work-piece is the Cross twenty-station Transfer-matic shown being loaded in Fig. 10. This unit completely machines die-cast aluminum flywheel housings for two different models of automatic transmissions. Also, a center bearing and two dowels are automatically pressed into each casting, and the parts are washed and dried for final assembly, on the same machine. The flywheel housing for one transmission model is 13 1/2 inches in diameter and about 4 3/8 inches long, while the other is 14 inches in diameter and 3 31/32 inches long.

At various stations along the machine, seen in the heading illustration, both the engine and transmission mounting surfaces of the flywheel housings are rough- and finish-faced, steps on the castings are turned, and all holes in the castings are drilled, bored, chamfered, reamed, or tapped. In addition, a bushing and two dowels are automatically pressed into each housing at the fourteenth and seventeenth stations, and the bushings are staked at four places by means of a die. The work-pieces are supported by heads on the opposite side of the transfer machine during assembly of the bushings and dowels. Fig. 11 shows the Arlin elevator and hopper mechanisms employed to position the bushings for pressing.

The housing assemblies are washed and dried at Stations 18 and 19 before unloading. A pro-

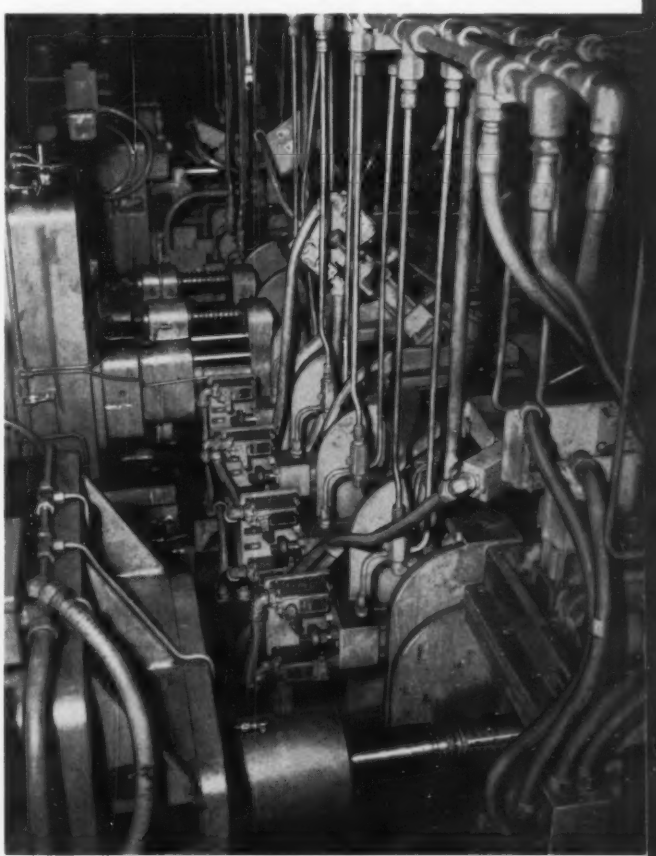


Fig. 8. Part of the thirty-two station transfer machine used to drill, ream, spot-face, countersink, and chamfer various holes in cast-iron pump covers.

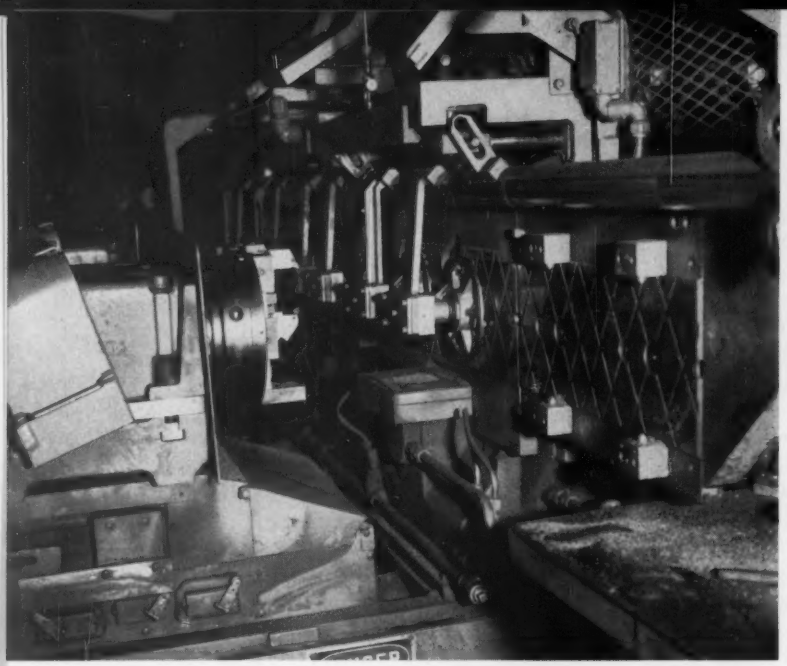


Fig. 9. Pump covers are indexed from station to station by means of vertical carrying-arms suspended from an overhead transfer bar.

duction of 250 parts per hour is possible at 80 per cent efficiency. Concentricity of the mating faces with relation to the axis of the housing, when locating from the two dowels, is maintained within 0.003 inch total indicator reading. Parallelism of the engine and transmission mounting surfaces is also held to the same limits. Pre-set cutting tools are stored in control boards along the machine to reduce the down time required when changing the tools. All heads are hydraulically fed, and rapid traverse is provided to and from the cutting position.

Segmented Design a Feature of Seventy-Five Station Transfer Machine

Segmented design is a major advantage of the Snyder seventy-five station, in-line transfer machine (Fig. 12) which is used to drill, countersink, counterbore, chamfer, ream, tap, or mill a total of forty-eight holes and slots in each cast-iron pump body. This machine is divided into twenty-three segments, with all segments made up of individual bases having vertical, horizontal, or angular slide units, Fig. 13. Also, the machine

Fig. 10. Loading end of a twenty-station machine which handles die-cast aluminum flywheel housings for two transmissions.

is made up in two sections, each having an individual master control panel, a loading station, and an ejection station. With this set-up, either section can be independently loaded, operated, and unloaded, and material stockpiled or finished, regardless of the operating condition of the other section.

The segment between the two machine sections, at Stations 47 and 48, is a hydraulically controlled indexing fixture that rotates and turns each casting over before it is fed into the second section. This segment is used as the auxiliary loading station if the first machine section is shut down for tool changes or maintenance. Pump bodies are transferred from station to station by a single transfer bar which lifts the castings from dowel locators at each station, moves them to the next station, and lowers them into machining position over two dowels. The transfer bar is made up in sections so that it can be lengthened or shortened to suit the removal or addition of base and slide units as required.

The use of segmented construction permits changing the design of the work-piece, thereby decreasing obsolescence of the machine. Also, maintenance of the 111-foot long machine is simplified. Each slide has a self-contained power unit driven by the motor which also drives the spindles. Power from the units feeds the slides and also operates the fixture mechanisms.

In-process inspection is accomplished on this transfer machine by both probing pins and air gages. Most small holes that have been drilled at

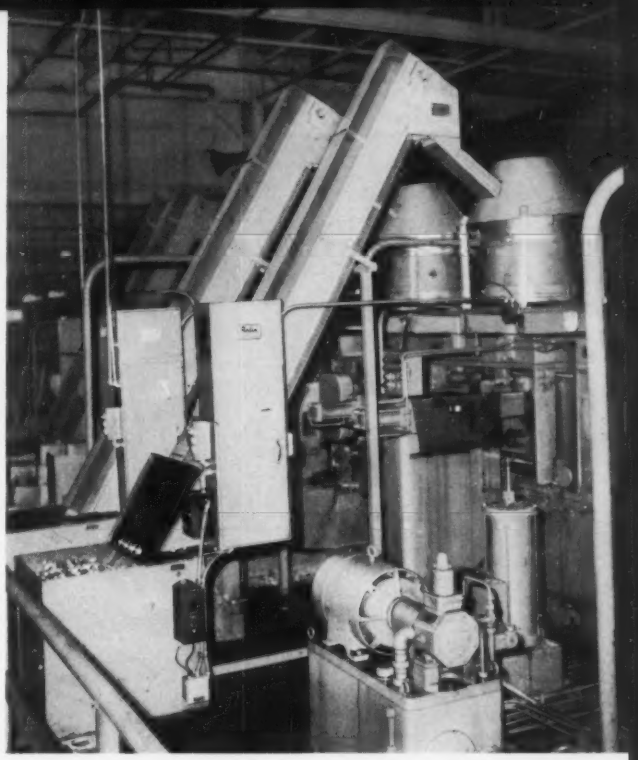


Fig. 11. Elevator and hopper mechanisms for positioning bushings that are to be pressed and staked in central bores of the flywheel housings.

Fig. 12. Signal lights on console show when heads have been fed to depth and retracted, as well as other functions of cycle.

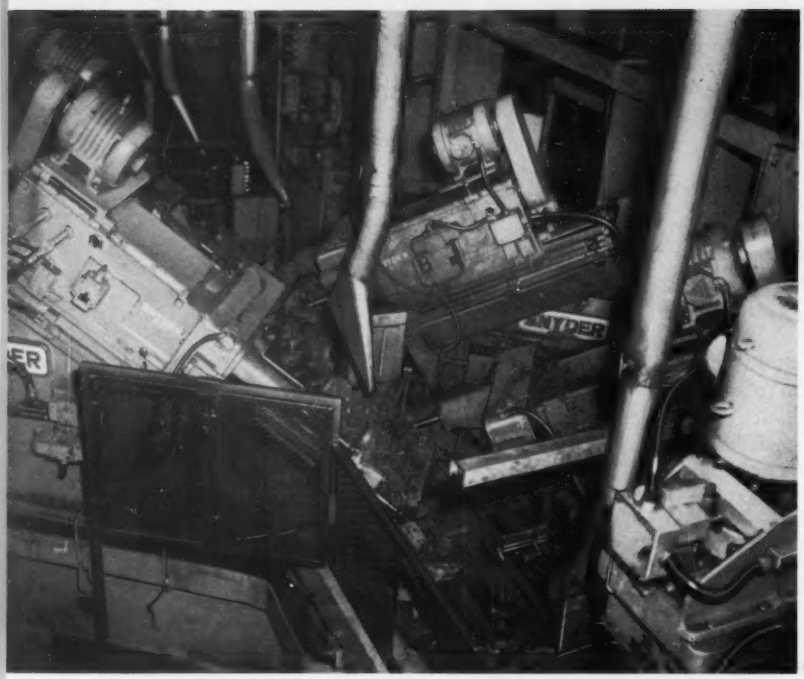


Fig. 13. Some of the angular heads employed on a seventy-five station transfer machine for drilling cast-iron pump bodies.

previous stations and that are to be reamed or tapped at subsequent stations are gaged with probing pins located on slide units at Stations 10, 19, 22, 25, 28, and 40. If the hydraulically operated probing pins contact the casting where holes should have been drilled, broken tools in the holes, or the bottoms of holes drilled to insufficient depth, the pins retract and contact limit switches which automatically stop the machine. In this way, tool breakage is minimized. Also, the production of scrap is practically eliminated with this method.

Close-tolerance holes are inspected by means of air gages mounted on sliding heads at Stations 4, 9, 34, 71, and 73. If the holes have not been machined to the required limits, the transfer line is again automatically shut down until the tools used to finish the holes have been replaced. Signal lights on the consoles, such as the one seen in Fig. 12, pin-point the location of any trouble, as well as indicating when the parts have been indexed, clamped, or unclamped; and when the heads have been fed to full depth or retracted. Additional lights indicate lubrication failure, and some light up when tools require changing, or air supply is interrupted.

Plastic Compressor Blades for Jet Engines

RESULTS of an experimental program using plastic compressor blades in place of conventional steel ones in a G-E jet engine have been announced by the General Electric Co.'s Aircraft Gas Turbine Division. The plastic compressor blades were used in five stages of a J47 compressor rotor for the tests. Over 100 hours of operating time were accumulated on the experimental engine during the program.

Composed of a reinforced phenolic resin, the plastic blades show very good erosion resistance, are capable of operating continuously between 450 and 500 degrees F. and have excellent stress characteristics. While the blades operated successfully in the J47 engine, the 500-degree temperature limitation precludes their use in advanced engines where operating temperatures are higher. However, if resins are developed which can withstand the higher temperatures, it is felt that plastic blades may be used in the future.

The plastic blades weigh about 6 pounds less per compressor stage than conventional steel ones, and manufacturing costs appear to be only 25 per cent of forged blade expense. Moreover, the use of critical materials is eliminated, which is of major significance during time of national emergency.

Designing Progressive Dies

Second and concluding installment of an article dealing with the construction and functioning of progressive dies, the lay-out of scrap strips, and general considerations in die design

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CALCULATION of developed blank lengths, lay-out of scrap strips, and construction features of progressive dies were described in the first installment of this article, published in March, 1956, MACHINERY, page 146. Operations typical of those performed in a progressive die, a superimposition method of die lay-out, and some points to be considered when designing these dies, will be presented in this concluding installment.

Typical Operations Performed in Progressive Dies

Piercing of holes, including pilot holes, is usually the first step in the sequence of operations performed in a progressive die. If the work-piece drawing designates a group of holes to be held in close dimensional relation to one another, it is desirable, if possible, to pierce them in one station. However, if the holes are located too closely to provide adequate punch spacing, the die should be laid out to pierce every second or third hole in separate stations.

Punches of smaller diameter than the thickness of the material should be lapped lengthwise. For piercing small holes through comparatively heavy sections, stub punches should be used. To prevent rotation of irregularly shaped punches in the punch-holder, the use of either square or rectangular keys is preferred.

When perpendicularity and dimensional relationship of pierced holes to formed surfaces are of prime consideration, a side-piercing operation can be employed after the part has been formed. There are several methods of operating a punch in a horizontal plane, three of which are: cam actuation; wedge actuation; and rocker arm actuation.

A cam-actuated, side-piercing punch arrangement is illustrated in Fig. 7. Piercing punch *A* is held against follower-block *B* by punch-

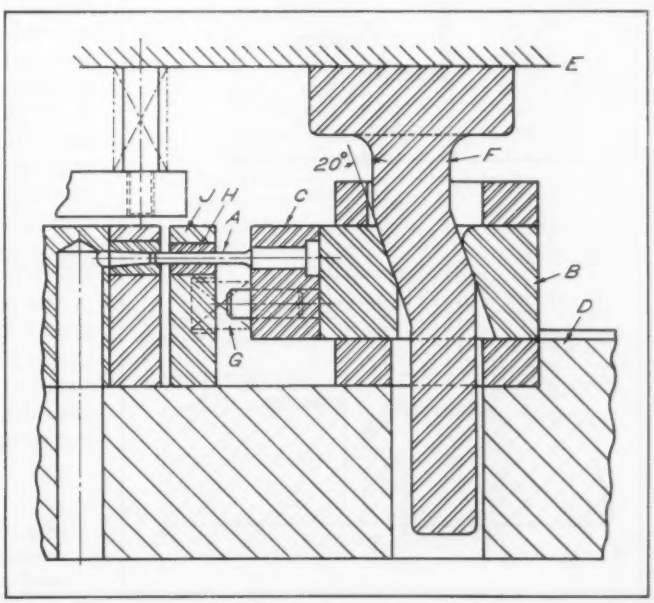


Fig. 7. Horizontal, cam-operated side-piercing punch arrangement. Cam (F) forces follower-block (B) and punch (A) to the left for piercing, then retracts them upon reversal of the press stroke.

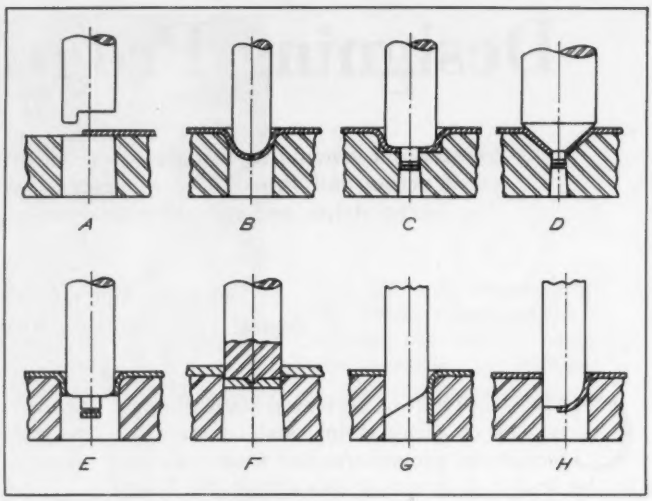


Fig. 8. Typical punches and bushings used for various metal-working functions in progressive dies as well as in simple dies.

retainer *C*. The follower-block rides in a guide way, cut across the surface of die-block *D*. Attached to punch-holder *E* is a cam-shaped member *F* that extends through a similarly shaped opening in the follower-block.

As the punch-holder descends, the action of cam *F* forces follower-block *B* to the left against spring *G*. This causes punch *A* to pass through guide bushing *H* in stripper plate *J*. During the up stroke of the press, the movement of cam *F* serves to return the follower-block and punch to their original positions. The advantage of this design is that the cam and follower-block are engaged at all times, therefore, the position of the punch is always under control.

Various drawing operations can be performed in a progressive die, provided that the metal be allowed to flow without stretching, thus maintaining a constant advance between stations. Also, there should be no interference with the drawing operation due to restraint of the scrap strip. To satisfy these requirements, the blank and the partially formed work should be carried in the strip by a flexible type suspension. This might consist of either slit fingers or cut-outs in the scrap material surrounding the blank.

In Fig. 8 are illustrated several different punches and bushings for performing a variety of standard operations such as might be incorporated in any progressive die. Among these tools are: notching, *A*; embossing, *B*; piercing and embossing, *C*; countersinking, *D*; extruding, *E*; prick-point punching, *F*; straight lancing, *G*; and spherical lancing, *H*. The embossing and extruding operations involve some flow of the material being worked.

Notching is actually another form of piercing, the difference being that only a part of the punch perimeter is utilized to create the contour of the part. Die stations for notching are often provided to partially form the outline of a part that is to be completed by a blanking punch. This reduces the operating load on the blanking punch and also allows the part to be separated from the scrap strip in steps. The load required for

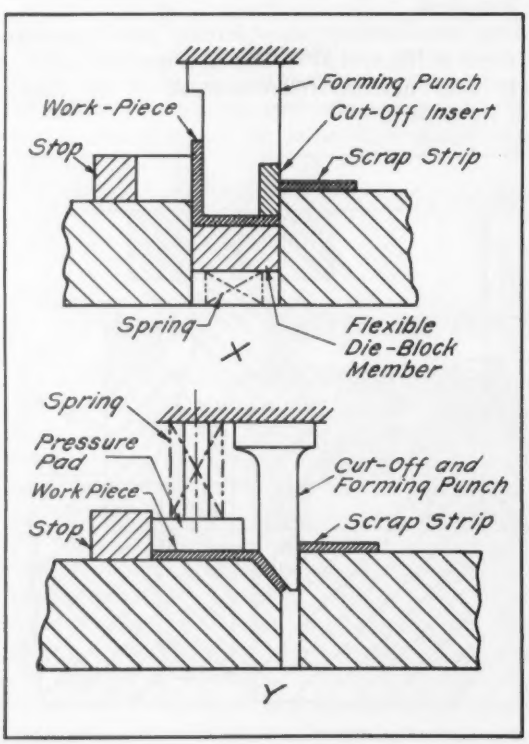


Fig. 9. Cutting-off and forming in a single step using a flexible die member, view X, and a spring-loaded punch-holder, view Y.

notching can be reduced by providing the punch with a heel (*A*, Fig. 8) so that it will be supported in the die prior to cutting, and part the metal with a gradual shearing action.

Clearance between the punch and the die opening is responsible for the cut edges of the blank being rough and out-of-square. Although this edge condition is satisfactory for many applications, there are some cases in which it is highly objectionable. To remedy this situation a shaving operation is called for. Since very little metal is removed by shaving, superior finish and greater accuracy are obtained. Shaving allowances are listed as a function of blank thickness, material hardness, and number of shaving steps contemplated in Table 2.

Most forming and bending operations that are included in the sequence of steps in a progressive die require that the die-block, or part support, be flexible. In other words, the die-block should be backed by either springs or air pressure so that it will yield under the influence of the punch to create the shape desired in the work-piece.

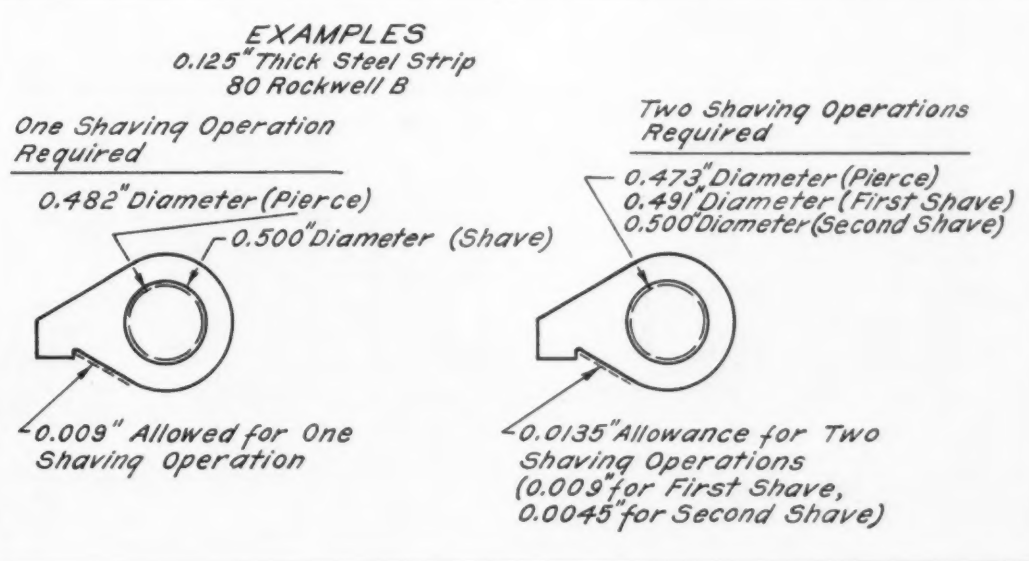
One of the simplest and most common types of bending operations can be seen at X in Fig. 9. Here the part is both cut off and bent through an arc of 90 degrees in one movement of the punch. A similar combination of operations is shown at Y, where a part requires the downward forming of an ear. In this example, the spring action (not shown) is incorporated in the punch-holder.

Channel bending, or U-bending, is a more complicated procedure. Three common but expensive methods are employed, side-kicking by cam action, previously described with regard to side-piercing; side-kicking by wedge action; and side-kicking by means of a rocker arm. The last method for forming a channel bend is illustrated in detail in Fig. 10.

At X in Fig. 10 is shown a part to be formed. Two stations, utilizing side-kicking by means of a rocker arm as shown at Y, were used for the

Table 2. Material Allowances for Shaving Operations

Thickness of Blank, Inch	Rockwell B Hardness					
	50 to 75	75 to 90	90 to 105	50 to 75	75 to 90	90 to 105
	Allowance per Side for One Shaving Cut, Inch			Additional Allowance per Side for Second Shaving Cut (If Required), Inch		
3/64 (0.0469)	0.0025	0.003	0.004	0.0013	0.0015	0.002
1/16 (0.0625)	0.003	0.004	0.005	0.0015	0.002	0.0025
5/64 (0.078)	0.0035	0.005	0.006–0.007	0.0018	0.0025	0.003–0.0035
3/32 (0.0937)	0.004	0.006	0.007–0.008	0.002	0.003	0.0035–0.004
7/64 (0.1094)	0.005	0.007	0.009–0.011	0.0025	0.0035	0.0045–0.0055
1/8 (0.125)	0.007	0.009	0.012–0.014	0.0035	0.0045	0.006–0.007



precision forming of this U-shaped bend. In the first station the part is rough-shaped by straight forming fingers *A* that are screwed and pinned to slide *B*. The slide is forced upward by rocker arm *C*. As the forming fingers are elevated, they wrap work-piece *D* around forming punch *E*. During the return movement of the press ram, the part is removed from the punch by ejector pin *F* which is located within the punch.

In the second forming station the part is finished to shape by a pair of scissors *G* that are caused to pivot by contact with fixed cam-blocks *H*. The scissors are mounted on pins driven into slide *J*. Ejection pin *K*, similar to *F*, drives the finished part from punch *L*. Alignment between the die-block and the spring-loaded punches is maintained by pilot-pin *M* which passes through bushing *N*.

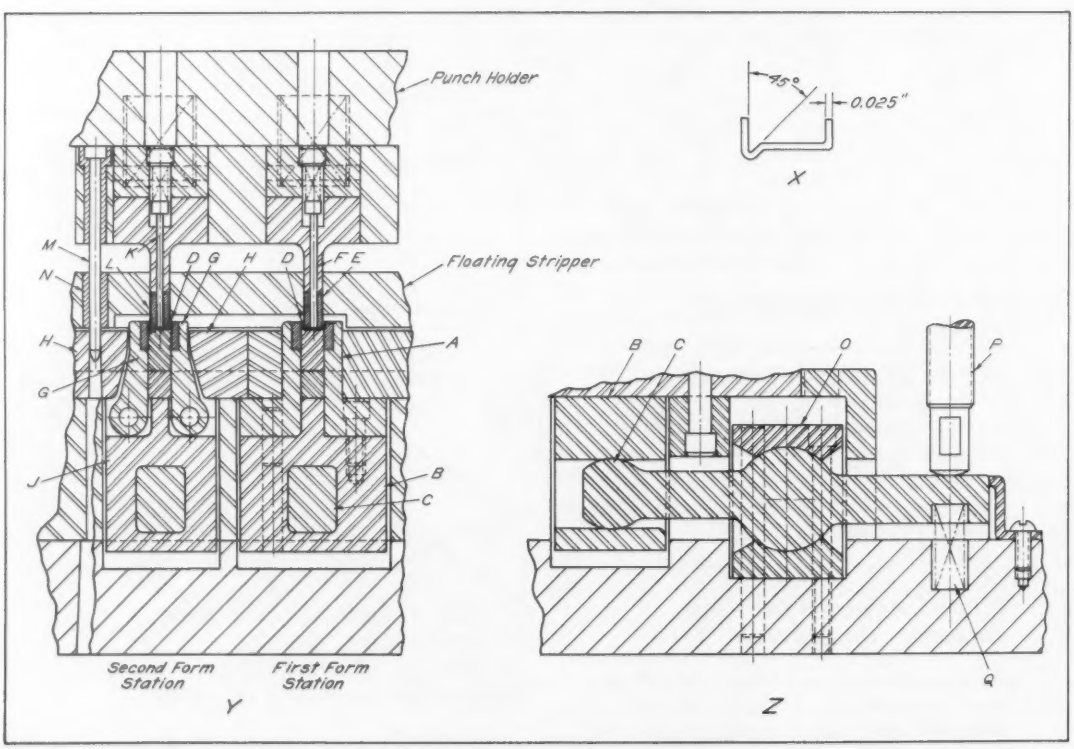
A section cut through the center of one rocker arm is shown at Z. Rocker arm *C* pivots in split bearing *O*. At its left-hand end, the rocker arm engages slide *B*. Adjusting-stud *P* is attached to the punch-holder and contacts the right-hand end of the rocker arm. On the down stroke of the press, the adjusting-stud strikes the rocker arm, pivoting it in a clockwise direction against return spring *Q*. This action causes slide *B* to rise, at which time the forming of the part takes place. Upon retraction of the adjusting-stud, spring *Q* forces the rocker arm to its original position, carrying slide *B* with it.

Superimposition Used for Progressive Die Lay-out

Designing of progressive dies has been facilitated by the recent adoption of a lay-out method in which all the applicable tools are superimposed on the work-piece drawing. After a part drawing is completely developed, it is blown up to a ratio of 10 to 1 or larger. The position of the first finger stop, the corresponding advance to the next station, the location of pilot holes, and the stock width are clearly marked. Location of the punches, and the station in which they are to function, are accurately indicated, as shown in Fig. 11.

By superimposing all the punches in their respective positions on the enlarged developed part drawing, a coherent design can be obtained. Necessary overlaps (indicated by small cross-hatch areas in the illustration) between neighboring notching punches are assured, and any possible interference between working members

Fig. 10. Forming stations utilize side-kicking actuated by rocker arms to produce the channel-shaped member shown at X.



can be foreseen and prevented. If the enlarged drawing is accurately made, relative locations of punches and also their respective jig-bore dimensions can be graphically determined. This will serve as a good check on the accuracy of mathematical calculations. For example, if the part drawing is enlarged to twenty times its actual size, an error of 1/64 inch on the drawing would represent an error of less than 0.001 inch in the jig-bore dimension.

Using the enlarged diagram as a guide, the progressive die shown in Fig. 12 was designed and constructed. The floating stripper plate *A* has been placed alongside the die members so that the die-blocks can be seen. A length of the scrap strip that has passed through the die, together with several completed components, is shown in the lower left-hand corner of the illustration.

Floating stripper *A* is guided by four pins *B*, and is supported on eight springs *C*. Two pairs of safety bumpers, each consisting of members *D* on the punch-holder and *D'* on the die-shoe, are provided to insure the correct shut height of the tool. Three pins *E* are pressed into the die-block to guide the rear edge of the strip stock. Finger stop *F* is placed just ahead of the first station, and stop-pin *G*, actuated by leaf spring *H*, is located just after the station. A slot *J* is provided in the die-block to accommodate the lanced ear on the part.

There are six spring-actuated stripper pushers *K* on the punch-holder. The purpose of the pushers is to force the stripper plate down before the punches contact the stock. A stock guide block *L* is screwed on each end of the stripper plate. These guide blocks elevate the stock with the stripper plate each time the ram ascends during normal operation of the press.

General Considerations in Designing Progressive Dies

General practice in considering the design of the metal-working members of a progressive die is to restrict dimensional tolerances in the die to one-half of those required by the working drawing. To assure long punch life in the face of expected wear on the member, it is machined to produce the largest hole size permitted by the given tolerances. In this way, as wear on the punch reduces its diameter slightly, the full tolerance range of the hole diameter will be utilized before the tool requires replacement. Further increase in the punch diameter may be necessary to compensate for future treatment of the part, such as plating, that might result in a material build-up. For all practical purposes, however, a

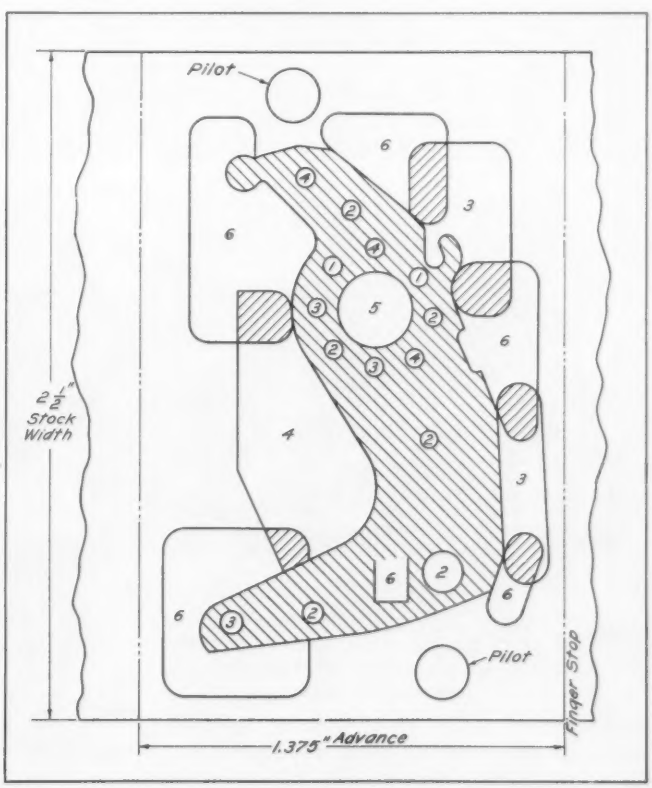


Fig. 11. All tools to be used in the shaping of a small component, and also the number of the stations in which they are to be employed, are superimposed on an enlarged developed drawing of the part.

build-up ranging from 0.0002 to 0.0007 inch is usually considered negligible.

Alterations of a die due to engineering changes on the work-piece can be simplified if the original tool is designed and constructed in sections. Then it would not be necessary to scrap the entire die set, but merely the section affected. For similar reasons filler blocks or adjusting screws should be provided above punches requiring frequent regrinding. To facilitate this assembly, knock-out holes are located under each die section.

A construction hole, drilled and reamed through the upper left-hand corner of the die-block, can serve as the reference point from which the location of all holes to be jig-bored is taken. Parting lines between the various sections of the die should also be included in the jig-boring lay-out.

It is good shop practice to taper-ream all slug and pilot holes to an angle of 1 degree. Clearance holes must be large enough to prevent the possibility of the slugs jamming in the die-block should they become cocked.

An important consideration in the design of a blanking punch is the provision of knock-out pins wherever needed. This prevents the frequent occurrence of the part adhering to the punch after the blanking has been completed. In the event knock-out pins are not incorporated in the design, it is a good idea to provide holes for them should the need arise in the future.

Die Casting Institute Initiates Field Service

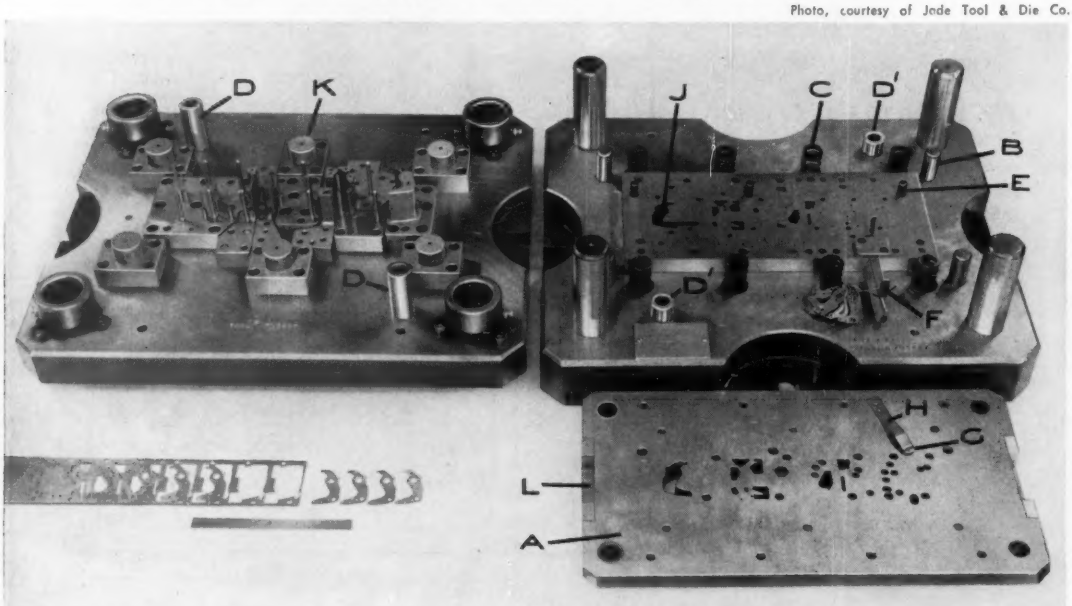
To improve technical services offered by job shop die-casters, a field representative program has been started by the American Die Casting Institute. With a new high of 104 companies, Institute members produce over 80 per cent of all die-castings made for sale in the United States.

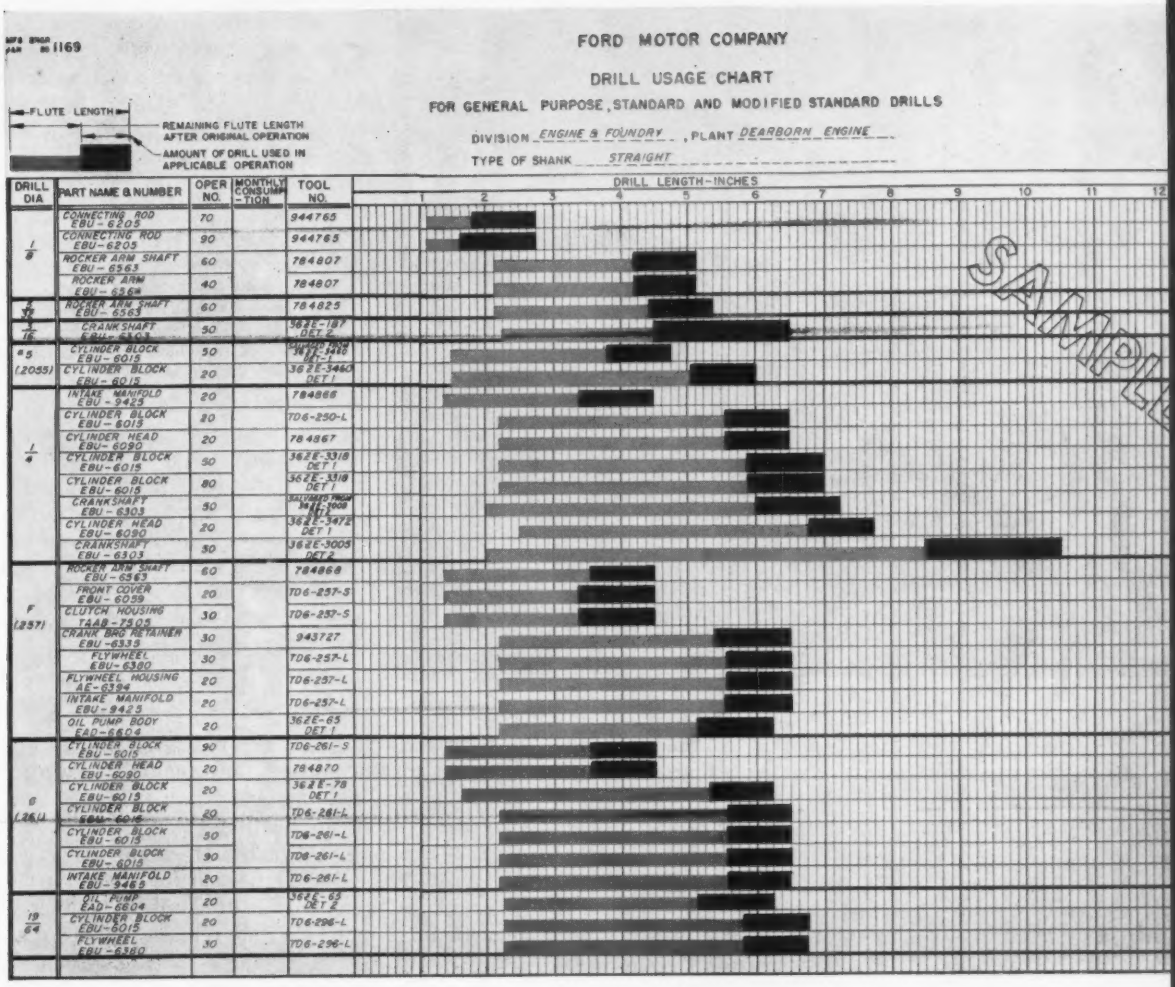
Field representatives, all recognized authorities on die-casting, will implement the continuing ADCI programs of research, quality control, and design and engineering assistance. With an organization of field experts available, it is felt that job shop die-casters can better integrate their activities to fit in with the problems of local industries. This is especially important in the present period, when designers and engineers are re-examining their products from the viewpoint of appearance and more efficient production.

Representatives for three of the four regions of the Institute have already been appointed. They are: C. M. Rollason, Eastern region; J. C. Fox, Central region; and J. M. Davis, Pacific Coast region. Mr. Rollason was previously general manager of the Die Casting Division of Alcoa. Until recently, Mr. Fox had been sales manager of the Doehler-Jarvis Division, National Lead Co. Mr. Davis formerly headed the Union Die Casting Co., Los Angeles, Calif. In addition to their services in the field, the representatives will take an active part in ADCI exhibit-meeting programs.

Fig. 12. Progressive die, with stripper plate (A) removed, that was constructed to produce the part illustrated in Fig. 11. The scrap strip and several finished components are shown in the lower left-hand corner.

Photo, courtesy of Jade Tool & Die Co.





FORD MOTOR COMPANY

DRILL USAGE CHART

FOR GENERAL PURPOSE, STANDARD AND MODIFIED STANDARD DRILLS

DIVISION ENGINE & FOUNDRY , PLANT DEARBORN ENGINE

TYPE OF SHANK STRAIGHT

FLUTE LENGTH — REMAINING FLUTE LENGTH AFTER ORIGINAL OPERATION — AMOUNT OF DRILL USED IN APPLICABLE OPERATION

DRILL DIA	PART NAME & NUMBER	OPER NO.	MONTHLY CONSUMPTION	TOOL NO.
1/8	CONNECTING ROD EBU-6205	70		944765
	CONNECTING ROD EBU-6205	90		944765
	ROCKER ARM SHAFT EBU-6563	60		784807
	ROCKER ARM EBU-6564	40		784607
5/32	ROCKER ARM SHAFT EBU-6563	60		784825
7/16	CRANKSHAFT EBU-6303	50		362E-187 DET 2
#5 (2055)	CYLINDER BLOCK EBU-6015	50		SALVAGED FROM 362E-3460 DET 1
	CYLINDER BLOCK EBU-6015	20		362E-3460 DET 1
1/4	INTAKE MANIFOLD EBU-9425	20		784866
	CYLINDER BLOCK EBU-6015	20		TD6-250-L
	CYLINDER HEAD EBU-6090	20		784867
	CYLINDER BLOCK EBU-6015	50		362E-3318 DET 1
	CYLINDER BLOCK EBU-6015	80		362E-3318 DET 1
	CRANKSHAFT EBU-6303	50		SALVAGED FROM 362E-3008 DET 1
	CYLINDER HEAD EBU-6090	20		362E-3472 DET 1
	CRANKSHAFT EBU-6303	30		362E-3005 DET 2
F (257)	ROCKER ARM SHAFT EBU-6563	60		784868
	FRONT COVER EBU-6059	20		TD6-257-S
	CLUTCH HOUSING TAAB-7505	30		TD6-257-S
	CRANK BRG RETAINER EBU-6335	30		943727
	FLYWHEEL EBU-6380	30		TD6-257-L
	FLYWHEEL HOUSING AE-6394	20		TD6-257-L
	INTAKE MANIFOLD EBU-9425	20		TD6-257-L
	OIL PUMP BODY EAD-6604	20		362E-65 DET 1
9 (261)	CYLINDER BLOCK EBU-6015	90		TD6-261-S
	CYLINDER HEAD EBU-6090	20		784870
	CYLINDER BLOCK EBU-6015	20		362E-78 DET 1
	CYLINDER BLOCK EBU-6015	20		TD6-261-L
	CYLINDER BLOCK EBU-6015	50		TD6-261-L
	CYLINDER BLOCK EBU-6015	90		TD6-261-L
	INTAKE MANIFOLD EBU-9465	20		TD6-261-L
19/64	OIL PUMP EAD-6604	20		362E-63 DET 2
	CYLINDER BLOCK EBU-6015	20		TD6-296-L
	FLYWHEEL EBU-6380	30		TD6-296-L

DRILL LENGTH—INCHES 1 2 3 4 5 6 7 8 9 10 11 12

SAMPLE

Usage Charts Increase Tool Life

Charts showing various applications of similar size cutting tools facilitate maximum utilization. Also, variety of tools stocked has been reduced, and fewer tools have to be salvaged or scrapped

By CHARLES H. WICK, Managing Editor

CONCERNS using a large number of various size cutting tools can profit from a simple yet ingenious plan recently introduced by the Ford Motor Co., Dearborn, Mich. With this method, charts are prepared listing different applications of similar or identical size tools.

Such charts clearly indicate the original dimensions of new tools, and the limiting dimensions for maximum tool usage on each operation. Thereby, reassignment to applications on other parts, operations, or plants is facilitated; maximum utilization of tools is realized, and inventory requirements are reduced.

Savings resulting from this system are substantial, because of the large quantities of tools required for high-volume production. For example, with approximately 70,000 drills used each month by the Ford Motor Co., large yearly savings are attained.

Adequate means for effective control of perishable tools must be employed, particularly to meet the problems arising from decentralization of

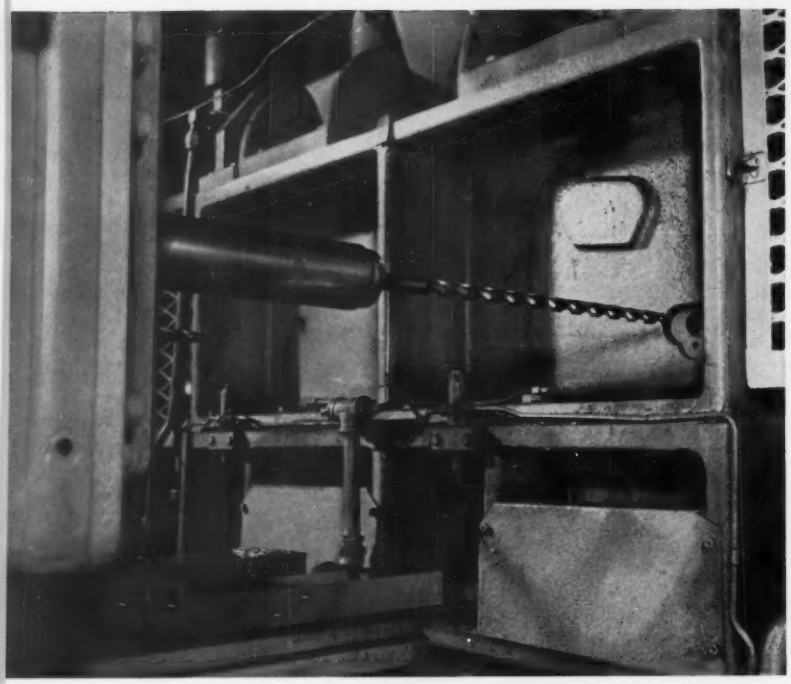


Fig. 1. Only 1 3/8 inches of the 14 5/8-inch total flute length on these 35/64-inch diameter drills can be used in drilling oil gallery holes in engine blocks.

manufacturing facilities. For example, automobile assembly plants require numerous short-length drills—one plant uses 7100 No. 27 (0.144-inch diameter) drills per month for a trim assembly operation, and another 6500 9/64-inch diameter drills for mounting the door center-pillar molding. When company-wide drill usage charts were prepared, it was found that some of the manufacturing plants were scrapping drills that could be used for such operations. Now, requirements of all plants can be pooled, and tools reassigned whenever possible.

A sample drill usage chart, prepared by Engine Manufacturing Engineering—Engine & Foundry Division, is shown in the heading illustration. The drills are grouped by diameter, or letter or number size, and then subdivided according to application by giving the part name and number for which the drill is used, the operation number, monthly requirements, and tool number. Lengths of the drills are indicated on the graph at the right, showing the amount of drill flute length usable for the originally specified application by a higher solid-colored bar, and the flute length remaining after the original operation by a lower shaded bar. The amount of drill flute length that can be used for a particular application will depend on the machine or spindle design, and the adapter with which the tool is used. In many cases, less than 1 inch of flute length on long drills can be used for the specified operation.

With such charts, it becomes immediately apparent that the unused flute length remaining after the original operation can often be employed for other applications. For example, the 10 1/2-inch long, 1/4-inch diameter drills (Tool No. 36ZE-3005, Det. 2) needed for operation 50 on crankshafts can only be used until 6 1/2 inches of their 8 1/2-inch long flute remain. However, as indicated by the chart, these tools can then be shortened to an over-all length of 7 1/4 inches and 1 1/4 inches more of the flute length used in drilling other holes in the same part. Similarly, the 6-inch long, No. 5 (0.2055 inch diameter) drill used in operation 20 on the cylinder block is subsequently shortened to 4 3/4 inches and used for operation 50 on the same part.

In another machining operation performed on cylinder blocks, drills 35/64 inch in diameter by 17 1/2 inches long are required. These tools are used at Station 15 of a Natco Holeway 16-station, automatic transfer machine, as seen in Fig. 1, for drilling the oil gallery holes. Only 1 3/8 inches of the 14 5/8-inch total flute length on these expensive drills can be employed for this application. However, now the tools are successively shortened to 11 1/2, 10, and 8 5/8 inches, and a total of 4 3/8 inches more of the available flute length is used in three other operations on the same part. Fig. 2 shows the same drill (after having been cut down to a length of 8 5/8 inches) being used at Station 10 of the Natco machine for drilling an oil-hole to a depth of 2 inches.

In addition to exposing other needs for similar size drills, the charts are a valuable aid in standardizing on the over-all and flute lengths specified on drills of the same diameter for various operations. An attempt is made to specify the same length for as many drill requirements as possible. This provides an effective method of inventory control by minimizing the variety of tools that must be carried in stock, thus permitting quantity buying with the advantages of lower costs and multiple sources of supply. Extension sleeves can usually be applied to the machine spindles to permit using standard length drills.

It has been estimated that the charts are responsible for a reduction of approximately 20 per cent in the number of drills requiring sharpening in the tool-room. Previously, in many instances tools were sharpened and returned to the production machine—too short for further use. Now, the charts are referred to by the tool inspector, Fig. 3, to determine the minimum limit to which the flute length can be ground for a particular operation. Drills will not be ground beyond these limits until other applications have been found for the tools.

A major benefit derived from this plan is that the individual plants have become more aware of perishable tool usage, and have tightened their tool control systems. Reassignment of used tools to other operations in the same plant has increased, resulting in maximum utilization, greatly reduced waste, and substantial savings.

Drills now in use are listed on a chart by each plant, and revisions are made as necessary. After all possible reassignments have been made within the plant, copies of the charts are furnished to all tool analysts, store-rooms, and production activities within the division. Here, a further study is made to determine possible applications in other plants within the same division.

Finally, copies of the charts from all plants in the various divisions of the Ford Motor Co. are forwarded to the General Stores and Salvage Services Section of the Manufacturing Services Division. There, a master chart for company-wide usage analysis is compiled, resulting in the transfer of some tools to other plants or divisions. The master is made up of interchangeable sliding panels, reproduced photographically from the original charts, to facilitate keeping it up to date.

Cutting tools which can no longer be used or reassigned within the plant or division, are sent to the salvage section. There, the tools are segregated into sizes and classifications such as drills, broaches, milling cutters, reamers, tool bits, and other tools that are deemed usable elsewhere.

Drills, reamers, and milling cutters are inspected to determine their diameters, as well as the condition of their flutes or teeth. After consulting the master tool charts, the various plants are informed of the usable tools available. Also, the purchasing department is contacted to determine special tool orders which might be filled from available stocks, and, in some cases, the individual plants contact the salvage section. Such practices often uncover applications for tools which have been marked obsolete.

An attempt is made to keep salvage costs within 50 per cent of the original tool price. Otherwise, the tools are scrapped. Also, tools are never reworked until a definite order has been received from one of the manufacturing plants. Reconditioning of drills usually consists of cutting to required length, grinding of the periphery if the diameter is too large for the intended application, grinding of the drilling point, and application of the new tool number. In some cases, new shanks are butt-welded to used drills to increase their lengths for further applications.

Broken tools, as well as those for which no

Fig. 2. After reworking the drills seen in Fig. 1 to perform two other operations, the drills are again shortened and repointed for this application.

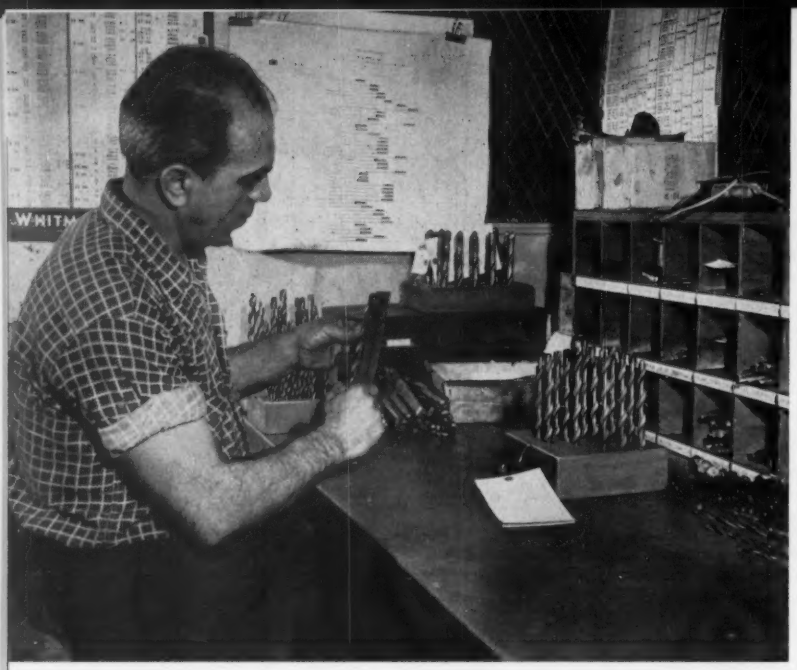
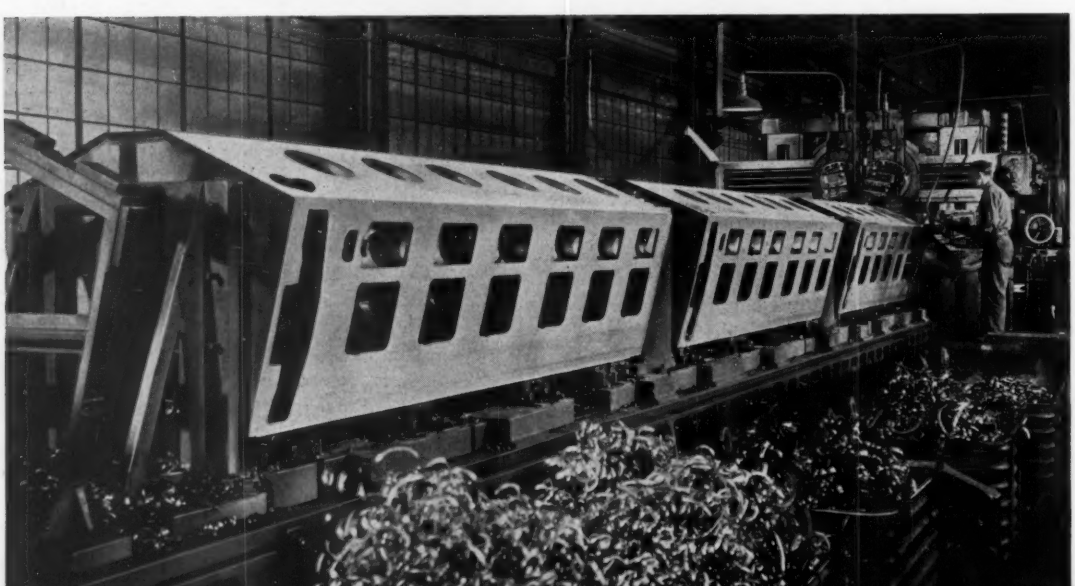


Fig. 3. In resharpening drills, tool usage charts are examined by the inspector to determine minimum flute length permissible, thus avoiding wasteful grinding.

additional application can be determined, are sorted into their specific cutting classification. For example, drills, reamers, milling cutters, broaches, and tool bits are separated. Further separation is made according to the material from which the tools are made, and the steels are sold as scrap by types—thus bringing higher prices. Also, the carbon steel shanks of drills are cut from the high-speed steel flute sections for this same purpose.

Tool usage charts prepared thus far under the expanded perishable tool control system have been confined to the grouping of general purpose, standard drills. However, it is planned to use the same basic chart to list groups of special purpose drills, such as heavy-duty drills, drills for aluminum or plastics, and carbide-tipped drills. Each separate grouping will be clearly identified and listed apart from the general purpose drills, and from each other. Similar charts will also be prepared for reamers and other types of cutting tools.

Planing blocks for vee type Diesel electric locomotive engines at Alco Products, Inc., Schenectady, N. Y. Angular tops of the blocks are machined by a coordinate feed of the cross-rail and cross-rail heads. Blocks are steel fabrications, and machine, a Gray planer. The twelve-cylinder, 1800-H.P. engine is supercharged, and powers four motors. Designated the DL-701, the new locomotive can be adapted to heavy-duty freight, high-speed passenger, or yard-switching service.



Round Drop-Hammer Dies Provide Important Economies

By J. H. ROWLEY, Foreman
Die Fabrication Shop, Santa Monica Division
Douglas Aircraft Co., Inc.

THE use of circular drop-hammer dies has reduced die fabrication time, conserved critical materials, lessened inventory, and promoted standardization of die sizes in the Santa Monica, Calif., division of the Douglas Aircraft Co., Inc. Round dies can be more conveniently mounted on drop-hammers than dies of rectangular or irregular outline, and such mishaps as broken ears or protruding flanges are eliminated. The cost of plaster castings required in making dies is also reduced because only the functioning portion of the tool is incorporated in the die. Hold-downs and other elements are incorporated in a metal base.

With round dies, the machining time required to finish the flat top or bottom surfaces is less than that with square or rectangular dies because less material need be removed in order to obtain flat surfaces. This is true not only because of the smaller area to be machined, but also due to a faster chill and more uniform shrinkage when the lead or Kirksite die member is cast. Uniform shrinking decreases the amount of concavity in the center of the die member. The cubic content of a round die is obviously less than that of a square or rectangular form that would accommodate the same size of part and so Kirksite and lead are conserved.

In a study of drop-hammer operations, it was determined that most drop-hammer work in the Douglas plant could be produced with dies of five different diameters, ranging from 24 to 48 inches. For ease in patternmaking, two rotary tables of the type shown in Fig. 1 were built. They will accommodate all die sizes. In preparing to make a die, a plaster casting is first produced from a master plaster pattern and then set up on the rotary table as shown in Fig. 1. Two halves of a split aluminum ring are then placed around the plaster casting as shown in Fig. 2. The two halves of the ring are held together by toggle clamps. This ring design permits the sections to be removed later from the pattern and sand mold without damaging them.

Split rings of two depths are available for each diameter from 24 to 42 inches and three depths for the 48-inch rings. This provides a wide range from which to choose the optimum depth.

In the set-up shown in Fig. 2, the plaster casting has been placed on an aluminum ring. This ring, as seen in Fig. 3, has four bosses that provide for locating hold-down holes in the hammer die. This arrangement standardizes the means of die attachment to the bolster of a hammer and eliminates the necessity of adding details to each plaster casting as required in previous methods of fabrication. Around this ring and the plaster casting that sits upon it, circular steel flasks are placed as shown in Fig. 2 to prepare for ramming sand to form a mold.

When the sand mold has been prepared, Kirk-

Fig. 1. Round plaster pattern for a drop-hammer die on a rotatable table that facilitates the work of patternmaking

Fig. 2. (Left) Typical plaster casting set in round steel molding flasks ready for ramming sand to form a mold

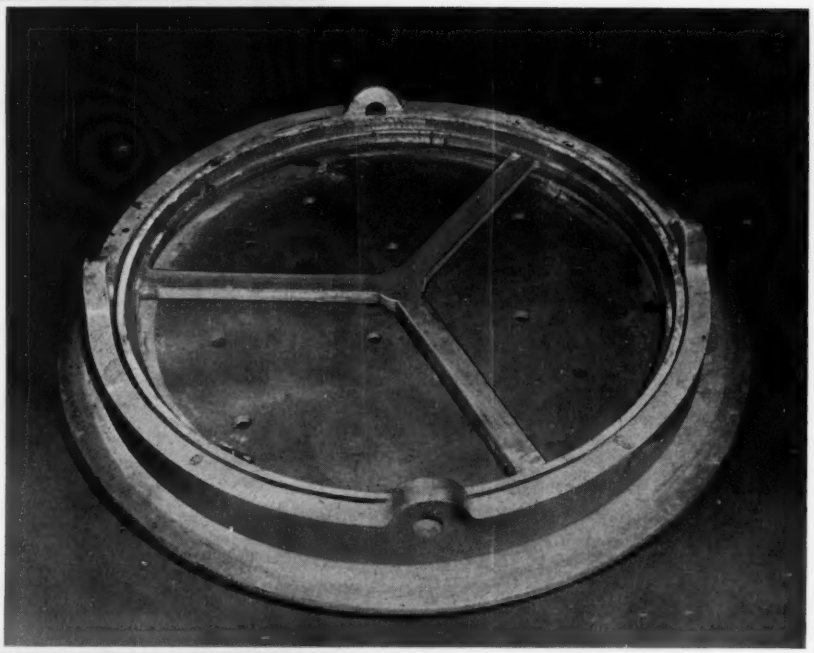


Fig. 3. (Right) Aluminum ring on which the plaster casting is placed preparatory to making the sand mold. Four bosses provide for locating in hammer die.

Fig. 4. (Left) Round female hammer die of Kirksite after the forming contours have been polished ready for use

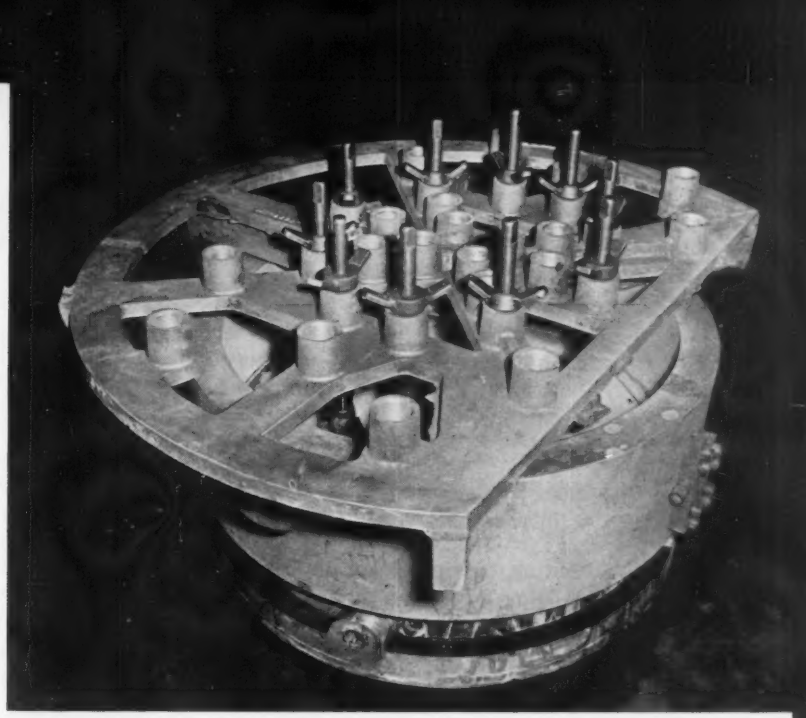


Fig. 5. Aluminum mold used in combination with the female Kirksite die member to produce a lead male member

site is poured to obtain a female die such as seen in Fig. 4. The face of the Kirksite die is then polished to finish all contours, after which the lead top or male die is poured on the female die. A mold for a lead male die is seen in Fig. 5. This mold is positioned with respect to ledges on the Kirksite casting in Fig. 4. Five sizes of aluminum molds are available.

After the lead has been poured and a certain amount of time has elapsed, a universal spider, such as seen in Fig. 5 astride the aluminum mold, is correctly positioned on the mold. The spider has a series of bosses with bored holes that provide a hole pattern to suit all Cecostamp hammers in the plant. Standard inserts to suit the particular die in process are placed in the respective bosses of the spider to provide the desired hole arrangement in the die.

When the lead casting has cooled, the spider and aluminum mold are removed, and the top surface of the lead die is machined to insure parallelism of top and bottom surfaces of the complete die. A typical die set is shown in Fig. 6 ready for installation on a Cecostamp.

Time studies were made of the conventional method of producing square or rectangular dies and the method followed in making round dies. It was found that plaster patterns for round dies can be produced with a 20 per cent reduction in man-hours as compared to the time involved in making rectangular or square dies. Approximately the same percentage of saving is possible in the time required to pour Kirksite female dies. The time needed to pour and machine lead male dies is about 50 per cent less. Much of this time-saving is achieved because of the fact that uniform chilling eliminates the need for machining except in the case of the largest dies.

Fig. 6. Complete drop-hammer die set of circular construction which comprises a bottom Kirksite female member and a lead male member

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

New Aluminum Casting Alloy Replaces Aluminum Alloy D132

A new aluminum casting alloy, designated "F132," was developed to replace aluminum alloy D132 in order to conserve nickel. Its availability has been announced by the Aluminum Co. of America, 1501 Alcoa Building, Pittsburgh 19, Pa. The nickel content of D132 alloy has a range from 0.5 to 1.5 per cent, whereas alloy F132 has a 0.5 per cent nickel maximum. Other properties of the two alloys are virtually identical.

The nominal chemical composition of F132 alloy is: copper, 2.0 to 4.0 per cent; iron, 1.2 per cent max.; silicon, 8.5 to 10.5 per cent; manganese, 0.5 per cent max.; magnesium, 0.5 to 1.5 per cent; zinc, 1.0 per cent max.; nickel, 0.5 per cent max.; titanium, 0.2 per cent max.; other alloying elements, 0.5 per cent max.; and aluminum, the balance. Typical properties exhibited by the new alloy are: tensile strength, 36,000 pounds per square inch; yield strength, 28,000 pounds per square inch; elongation, 1.0 per cent in 2 inches; Brinell hardness (500 kg. load, 10-mm. ball), 105.

Foundries supply either material in the —T5 temper (the same heat-treatment is used for both alloys). Growth and expansion characteristics of the alloys show no significant difference, and both are used to make automotive pistons.

Fluid Epoxy Resin with an Eight-Day Pot Life

A fluid epoxy resin which, when mixed with an appropriate amount of hardener, has a pot life of eight days has been announced by Furane Plastics Inc., 4516 Brazil St., Los Angeles 39, Calif. Identified as Epocast 13, this resin does not employ amine hardeners and is relatively toxic-free. Curing temperatures range from 200 to 250 degrees F.

It is expected that this casting resin will find considerable use in potting and encapsulation of electrical components and as a filler material for making large mechanical castings. It is available in kit quantities, allowing for an easy volumetric resin-hardener mix.

Large-Diameter Light-Wall Stainless-Steel Tubing Available

Types 304 and 321 "Weldrawn" stainless-steel light-wall tubing can now be obtained in outside diameters up to 2 1/16 inches from the Superior Tube Co., Germantown Ave., Norristown, Pa. This welded and cold-drawn tubing was previously offered in a maximum size of 1 1/8 inches outside diameter.

Present applications for large-diameter, light-wall tubing include bellows, low-pressure heat-exchanger tubes, flexible hose, aircraft ducting, fractional-horsepower motor casings, ceramic drills, electron power tube anodes and cathodes, and castings for radioactive well-logging instruments.

Minimum wall thicknesses range from 0.006 to 0.010 inch, depending upon the outside diameter, and the maximum wall thickness of all tubing up to 1 3/8 inches outside diameter is 0.035 inch. The maximum wall thickness of tubing 1 1/2 to 2 1/16 inches in outside diameter is 0.025 inch. Wall-thickness tolerances are plus or minus 10 per cent. Standard outside diameter tolerances are plus 0.005 inch, minus 0.000 inch, on tubing under 1 1/2 inches and plus 0.010 inch, minus 0.000 inch, on tubing of 1 1/2 inches and larger. Tubing can be furnished in lengths up to 28 feet.

Penetrating Oil with Lubrication and Rust-Prevention Properties

A fast-acting penetrating oil having properties of lubrication and rust-prevention and a high flash-point has been announced by the House of Laurila, 18483 Braile, Detroit 10, Mich. Known as "Bear Penetrating Oil," it is said to loosen rusted and frozen metal parts, such as bolts, bushings, pipes, and battery connectors, in a matter of minutes. Its low evaporation point gives a long protective period to dies and other metal parts on which it is used, and its efficiency

is not impaired by extreme temperatures. The oil may be applied with any standard applicator.

Stainless-Steel Brazing Alloy in Paste Form

A paste form of Nicrobraz stainless-steel brazing alloy has been made available by the Stainless Processing Division, Wall Colmonoy Corporation, 19345 John R Street, Detroit 3, Mich. This material, called Nicrobraz Paste, is easy to apply and easy to fuse. It is recommended for use in all types of brazing applications involving stainless steels, nickel-base, cobalt-base, and similar alloys, as well as low-alloy steels, carbon steels, and copper. The resulting joint is heat- and corrosion-resistant, providing a thin overlay in the area surrounding the joint where protection for low-alloy steels is required. When properly diluted, it can be applied by brushing, dipping, or any other type of hand or mechanical application. Nicrobraz Paste permits torch and induction brazing where brazing under vacuum or controlled atmospheres is not feasible.

Nicrobraz Paste is a mixture of nickel-chromium-boron alloy Nicrobraz powder and a cream type flux. It is particularly well suited for brazing thin stainless steel and other alloy sections where welding is not practical. The paste offers additional advantages in the brazing of dissimilar metals, such as brazing copper tubes or sheets to stainless steel, or brazing copper-nickel alloys.

The new flux, which is part of the paste, has good fluxing qualities and can be removed with cold water, hot water, steam and hot water, or flux-removal chemicals. Desired speed of removal will determine the de-fluxing agent to be used. Use of pure flux is recommended on heavy sections where the heat of brazing covers large areas.

Transparent Cutting Oil with Extreme Pressure Characteristics

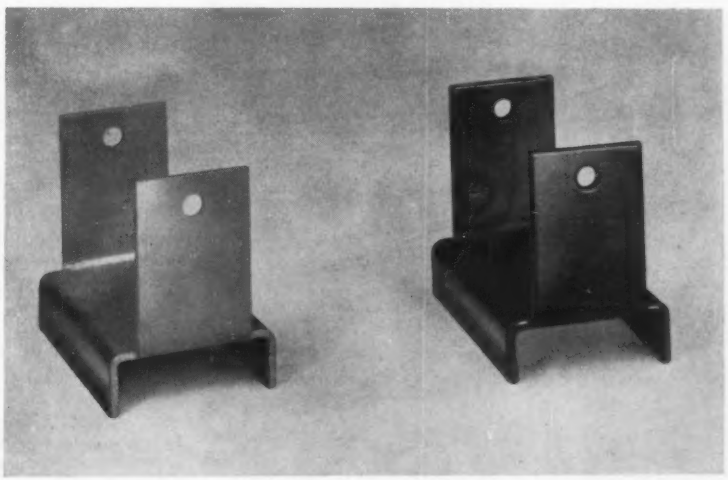
A cutting oil with extreme pressure characteristics, suitable for use in practically all cutting, broaching, threading, and similar operations, has been developed by the Texas Co., 135 E. 42nd St., New York 17, N. Y. The new "Transultex Cutting Oil B HD," being transparent, facilitates inspection of work in progress. This makes possible a low rate of rejection of finished pieces. According to the manufacturer, the cutting oil is easily removed from the finished pieces.

Process for Coating Objects with Plastic Materials

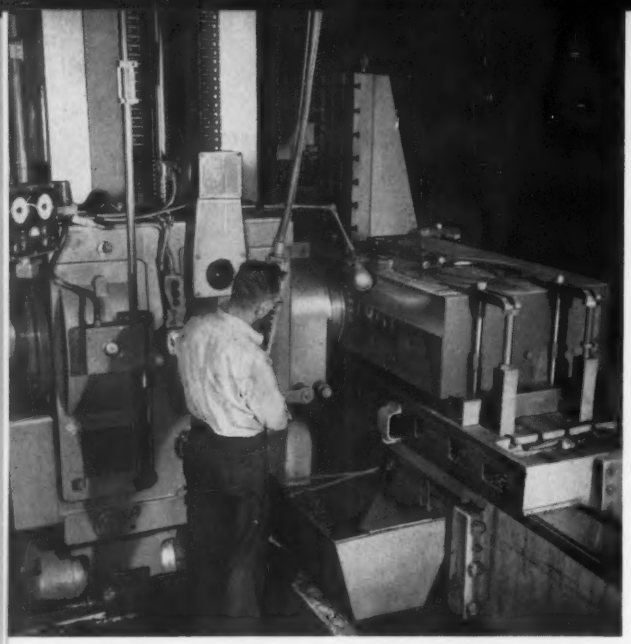
A new method of coating metals, ceramics, glass, and wood with various types of plastic materials has been adopted by Polymer Processes, Inc., Reading, Pa. Known as the "Whirlclad" process, it combines the natural advantages of the plastic materials with those of the parent materials to be coated.

Coating mediums that have been used successfully are: nylon, low-pressure polyethylene, polystyrene, cellulose acetate, butyrate, acrylics, and epoxy resins. No plasticizers or solvents are used. Essentially it consists of dipping preheated articles into a fluidized bed of plastic material in finely divided solid form. A heavy coating can be obtained with a single dip. Coating thicknesses range anywhere from 0.008 to 0.040 inch. Metals, thinner than 0.040 inch, are hard to coat because they do not maintain the necessary heat during the coating process.

Applications include coatings for such wear parts as jigs and fixtures, rollers, bushings, loading hooks, sliding surfaces, and such corrosion-resistant parts as household-appliance racks, plating hooks, valve bodies, fans, and ducts.



Two metal stage-curtain slides with (right) and without (left) a nylon coating which has been produced as a result of the "Whirlclad" process adopted by Polymer Processes, Inc., Reading, Pa.



Carbide Milling Speeds Output of Die-Blocks

By Carl Latora
Superintendent of Die Sinking
Kropp Forge Co.
Chicago, Ill.

TIME required to produce die-blocks at the Kropp Forge Co., Chicago, Ill., has been reduced 50 per cent or more by employing a heavy-duty milling machine equipped with insert type carbide blade cutters. This Sundstrand Rigidmil, seen in the heading illustration, is used for such heavy work as shanking of die-blocks, removing rough stock from dies prior to cutting impressions, removing old impressions prior to re-cutting, and re-working old blocks for new dies or inserts.

A horizontal type spindle head on this milling machine is powered by a 100-H.P. motor. Vertical feed to the head, in combination with longitudinal table feed, permits the machine to be operated either manually or by automatic cycle. The spindle speed can be varied from 15 to 200 R.P.M., and the head fed at rates ranging from 0.6 to 30 inches per minute. Feed rates for the milling machine table can be varied from 1 to 50 inches per minute, with a rapid traverse of 250 inches per minute available.

Die-blocks are forged from chromium-nickel-molybdenum alloy steel, and the blocks are prehardened and tempered to attain uniform hardness and resistance to impact, abrasion, and heat. The blocks are received by Kropp heat-treated to any of four hardness ranges, to suit the quantity, weight, and shape of the forgings to be produced, as well as the material from which the forgings are to be made.

First, holes are drilled in the sides of new blocks to facilitate handling. Before machining the surfaces of the blocks in which the die impressions will be sunk, shanks must be machined on the sides to secure the blocks to the forging press or drop-hammer. In shanking, one surface of each block is milled flat, as shown in Fig. 1, removing about 1/4 inch of stock in two passes. Then, a corner section (4 inches wide by 2 inches deep for one shank size) is milled along the top and bottom edges of this surface in a series of 1/2-inch deep cuts.

The tapered shanks are finish-formed with dovetail milling cutters, Fig. 2, removing from 1/8 to 5/32 inch of stock. Finally, one end and

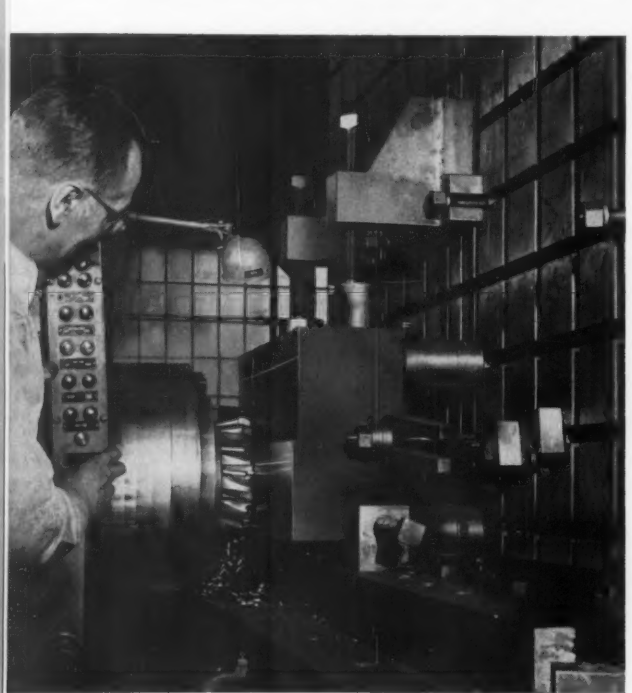


Fig. 1. Approximately 1/4 inch of stock is removed from one surface of the die-block in preparation for shanking.

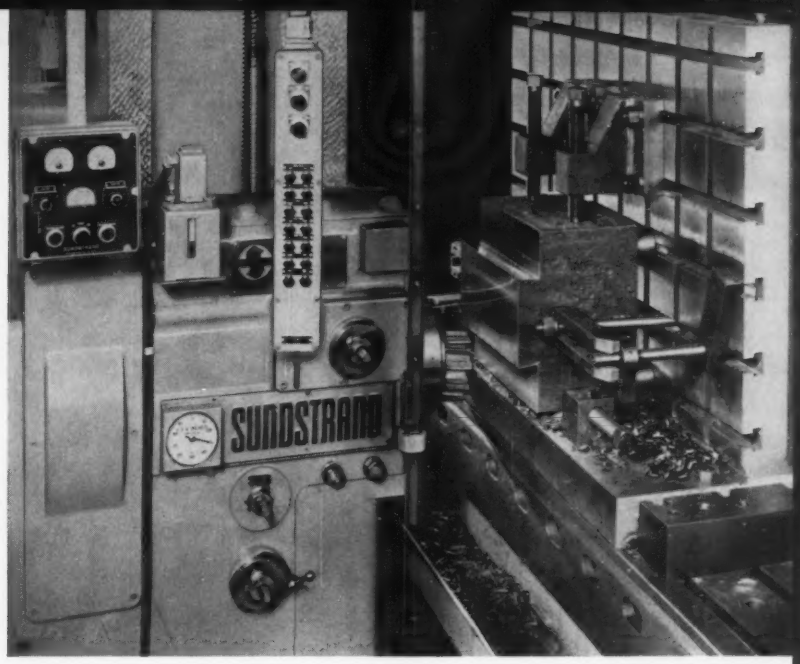


Fig. 2. Dovetail milling cutter removes from 1/8 to 5/32 inch of stock in finish-forming tapered shanks.

a side-surface of each block are milled at right angles with each other and the block face, to provide matched edges used as locating surfaces for dimensional lay-out of the impression to be cut. For this operation, approximately 1/4 inch of stock is removed from each surface. In reworking die-blocks that have already been used for forging, stock removal will vary with the design and condition of the die.

Face-milling and dovetail cutters for performing these operations range from 10 to 16 inches in diameter, depending on the size of die-block being machined. The smaller diameter cutters used for most operations have 12 or 14 inserted blades made from tungsten-titanium-tantalum carbide having a hardness of approximately 91 Rockwell A. Good results have been obtained with Kennametal K2S and Vascoloy-Ramet EE grades of steel-cutting carbides. The blades are set in the cutter body at a peripheral cutting-edge angle of 30 degrees, with a radial rake angle of minus 10 degrees and axial rake angles of plus 5 degrees. Peripheral and face clearance angles are ground to 5 degrees.

In milling die-blocks which have been tempered to a Brinell hardness between 341 and 375, the cutters are rotated at a surface speed of 150 feet per minute and the table fed at a rate up to 11 inches per minute. With these conditions, 1.2 cubic inches of metal are removed per minute per horsepower, with a chip load of 0.009 inch per cutter tooth. Rigid clamping of the die-block to the table is essential for such heavy stock removal. The large quantity of chips produced is automatically carried away by an underfloor chain conveyor.

The operator can easily control the machining cycle from a push-button pendant seen in Fig. 3. The indicators, visible on the panel at the left, show the head and table feed rates, and the horsepower being used. In shanking a matching set of new die-blocks (16 inches square by 12 inches thick) on this machine, the complete time required for milling all of the surfaces was less than 4 1/2 hours.

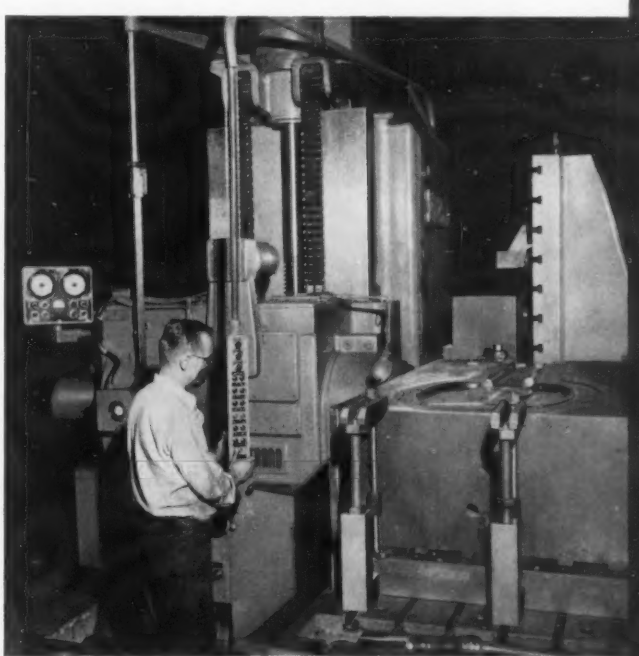
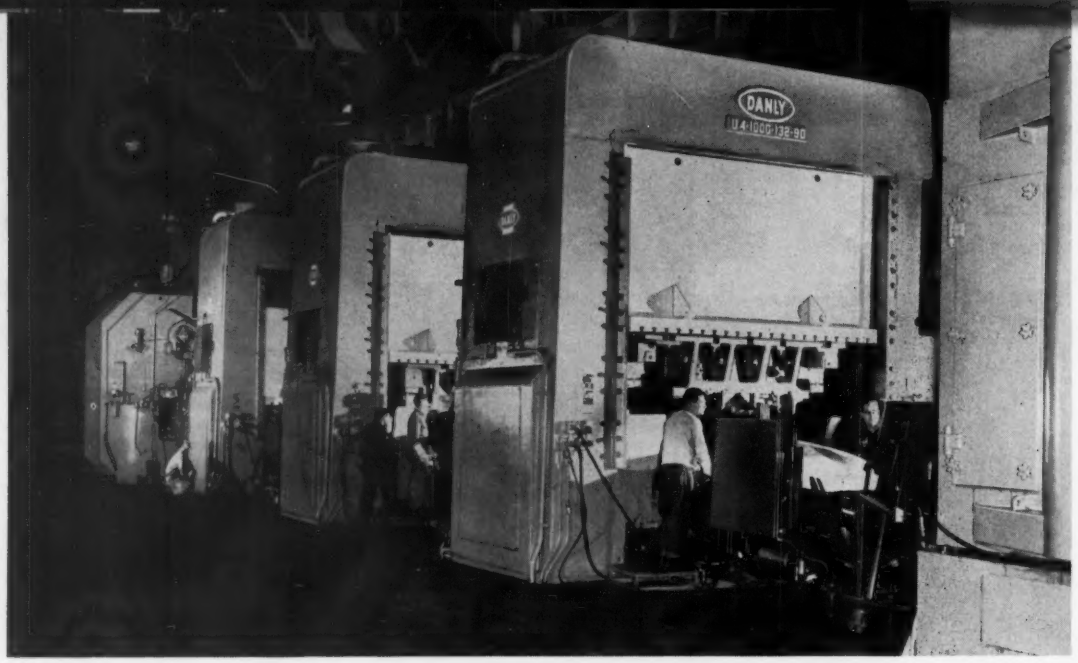


Fig. 3. Push-button pendant facilitates control of cycle. Indicators show feed rates and horsepower being used.



Ford Expands Cleveland Operations

By Edgar Altholz, Associate Editor

TWO large plants recently unveiled by the Ford Motor Co. near Cleveland now make this area the company's second largest base of operations. A 1,500,000-square foot stamping plant at Walton Hills, Ohio, turns out sheet-metal parts for Ford, Mercury, and Lincoln automobiles on twenty-two major press lines. At Brookpark Village, Ohio, 562,000 square feet of new space in a second engine plant there—Engine Plant No. 2—is being used to produce Ford Fairlane V-8 engines. When an additional 300,000 square feet of space under current construction is completed, all six-cylinder production will also be concentrated at the new engine plant.

The stamping plant—comprising 107 heavy presses on the major lines, as well as many smaller presses and welding machines, and extensive tool and die equipment—features the latest techniques of automation, material handling, and quality control. Designed to eliminate heavy, laborious, and hazardous working conditions, the automation devices set the unwieldy stampings in the presses with pin-point accuracy; reach into the presses to extract them, then speedily advance them to subsequent operations. When necessary, parts are automatically turned, twisted, or inverted.

A section of the Ford hood panel line, "Major Line 11," can be seen in the heading illustration. Principal elements are four Danly presses—the first, a 134- by 96-inch, 800-ton double-action press; and the other three, 132- by 90-inch, 1000-ton single-action presses. As each panel emerges from the line, it advances to a welding station, where it meets the front hood reinforcement, formed on an adjacent line ("Major Line 10").

In Fig. 1, a hood panel is shown being positioned at the entrance to the first press. Once it is placed over a feed table having a ball bearing surface, the panel goes through all four presses with a minimum amount of manual handling. To lubricate the dies, about every tenth sheet is spray-coated with drawing compound. A row of guns spans the work and is timed to spread the compound evenly over the advancing sheet in the areas requiring lubrication when the operator depresses a button.

The hood is drawn to shape in the first press, then automatically inverted (as shown in Fig. 2) and conveyed to the second press, where it is trimmed all around, and the area for the hood ornament is pierced. Cam-acting dies in the third press flange the fender sides and the front of the hood. In the fourth press, other cam-acting dies flange the cowl side and the fender side tabs, and reflange the fender sides and the nose of the hood.

Parts are removed from the rear of each press by an air-operated, side-arm extractor, Fig. 3.

This device operates in time with the press cycling—an "Iron Hand" projects into the dies to grip the work, then pulls it out onto a conveyor. All side-arm extractors are of standardized design. Adjustable supporting columns enable them to be used on all present or proposed stampings which may be produced in the plant. Portable mountings make it comparatively simple to move the extractors from one press line to another. Maintenance is simplified by wheeling the extractors into an automation construction area for repairs.

Power units for the extractors feature a short piston stroke. Each extractor is mounted on a gear rack which moves twice the distance of the piston, and thus, at double the speed. Only one-half as much air volume as would be normally required is used for the short stroke.

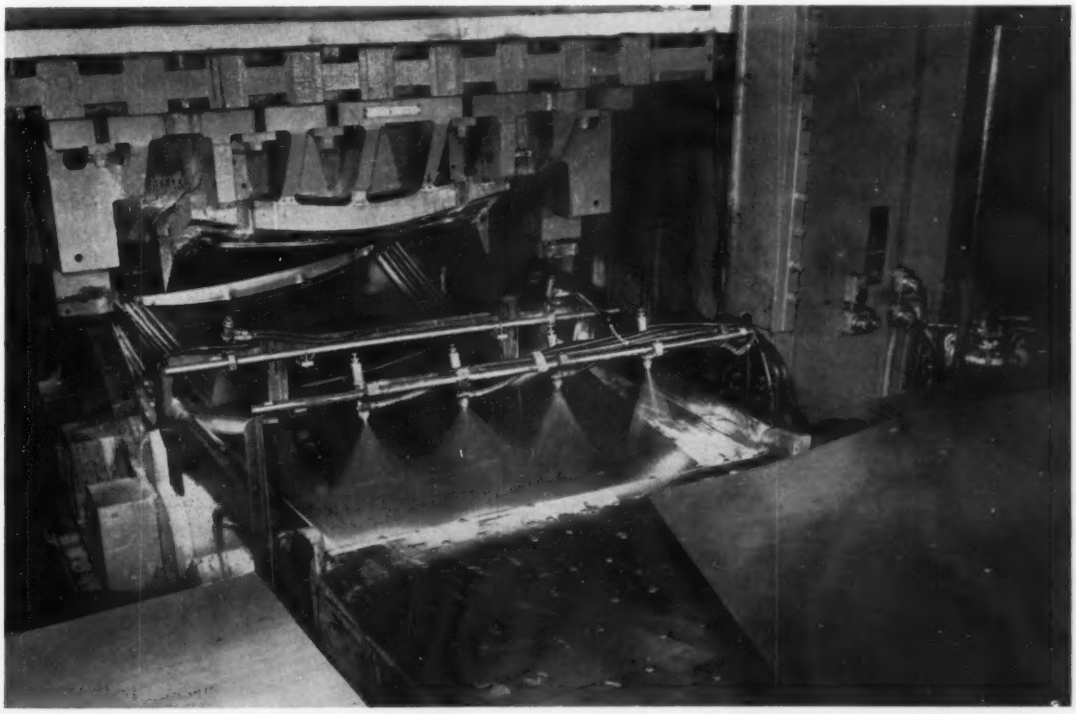
Automatic loaders receive stampings from the conveyors and locate them accurately in the dies, eliminating the necessity of employes having to reach into the presses. In place of a continuous forward motion, the loaders follow the path of a parallelogram, raising the work, shuttling it forward, lowering and locating the work in the dies, then retracting. Traverse speeds of the loaders range from 400 to 600 feet per minute. Like the extractors, there is inherent flexibility and standardization in the design of loaders, conveyors, and turnover units, making them easy to service and to adapt to different body stampings.

All automation is wired to a press control circuit, and either a single downward or upward sweep by a driver arm sends all units into action at precisely the correct moment. If a device is not in position at the proper time, the press will stop instantly. Drop-cam electric controls assure split-second timing. In Fig. 4, the controls can be seen on the press column at the right. This is a view of the rear of the third press on the hood panel line. The air cylinder above the gantry, also timed to the cycle, operates a plunger which descends at an angle to seat the work properly.

Other air cylinders operate ejectors on presses where side-arm extractors are not adaptable to the configuration of the stampings. In Fig. 5, for example, is a close-up rear view of a 96- by 72-inch Bliss single-action press which performs the final flanging operation on the front hood reinforcement. Here, an ejector flips the part over onto the discharge chute. The illustration shows the part in mid-air, a split second after leaving the die.

Welding activities at the stamping plant also typify the Ford emphasis on highly automated techniques. There are four "merry-go-rounds" which carry stampings through spot-welding operations. Two are used to assemble body side

Fig. 1. Batteries of spray guns spread drawing compound on the hood panel sheet as it is fed into the first press on the line. The guns are timed to spread the compound evenly.



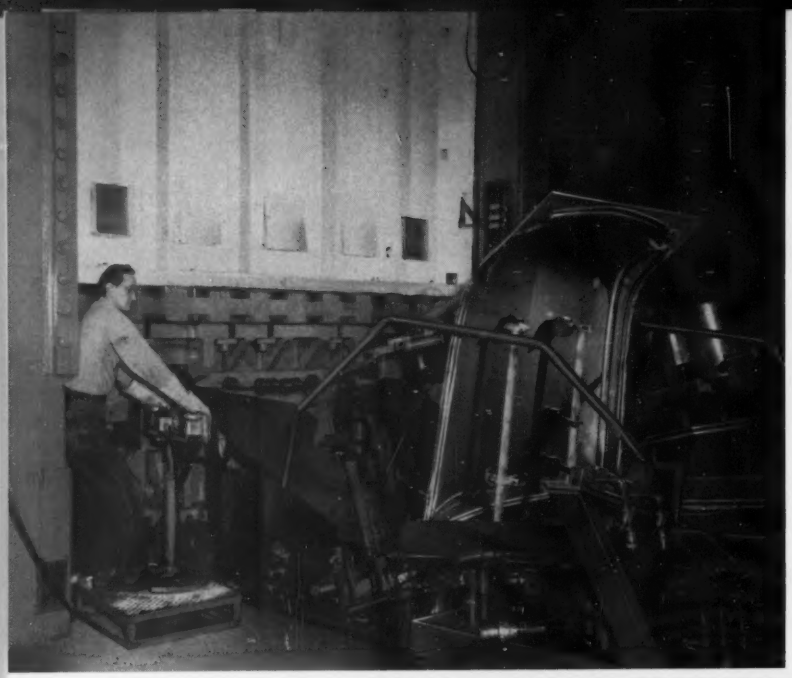


Fig. 2. (Left) After leaving the first press, the turnover device automatically inverts the hood panel for subsequent trimming, piercing, and flanging operations.

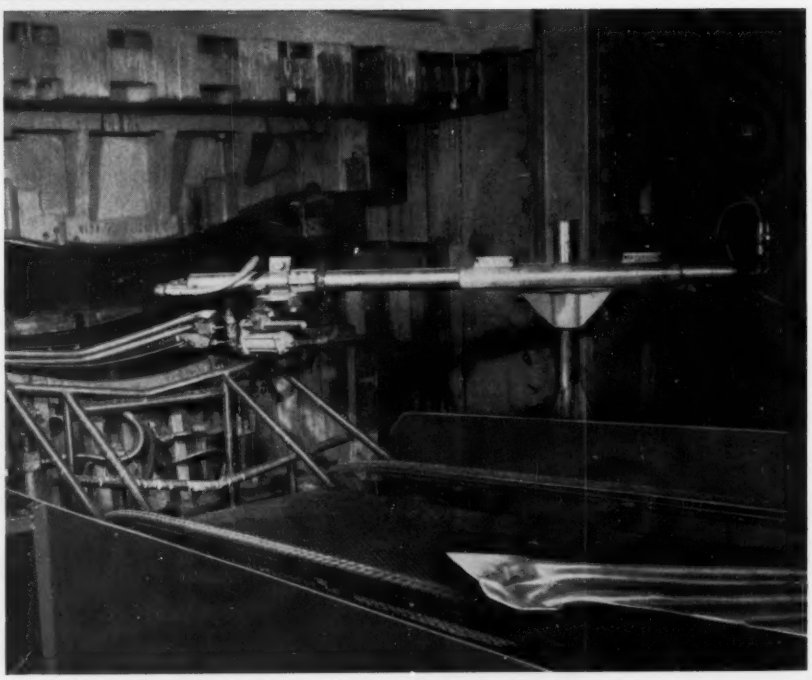


Fig. 3. (Right) On the up stroke of the press, knockouts free the hood panel from the die, and the side-arm extractor moves in. An "Iron Hand" grips one corner of the panel, then the extractor moves back.

panels, one for hoods and another, illustrated in Fig. 6, for cowl tops. Fixtures on wheels slowly carry the parts around an oval track. As the work moves along, workers at various stations spot-weld sub-assemblies in place with batteries of overhead guns.

The cowl-top assembly welding operations illustrated require nine guns. All guns are counterbalanced and are supported from a monorail. This gives them considerable mobility.

A staff of engineers, designers, and journeymen conceive, design, construct, and maintain all automation in the plant. They comprise the automation department. Devices are built in the large, well-equipped automation construction area. After devices are tested and turned over to production crews, safety screens are attached. When opened, the screens prevent the presses from cycling by means of disconnecting safety plugs.

Advances in automatic manufacturing methods are very much in evidence at Engine Plant No. 2. One significant innovation is the use of hydraulic oil as the motivating power for all transfer mechanisms required to move heavy

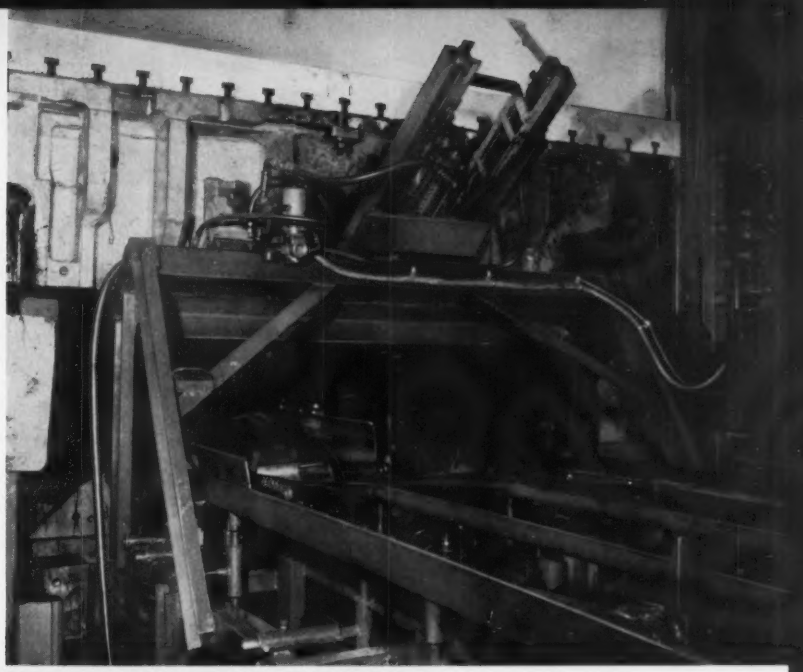


Fig. 4. (Right) The air cylinder which is mounted at an angle above the gantry seats the work after it has been pushed into position by the motion of the loader.

Fig. 5. (Left) A front hood reinforcement is shown in mid-air after being ejected from the die and flipped over onto the discharge chute. Hood is then in proper position for the next operation.

loads. A standardized type of hydraulic actuator turns oil pressure into rotary motion. This motion shuttles conveyors carrying engine parts between machine tools and, if necessary, turns work-pieces around for successive operations.

Another major improvement is in the actuation of electrical limit switches which operate the automation equipment. The switches are not in direct contact with the parts, mechanical actuators serving as the go-between. In this way, the switch mechanisms are protected from damage and from oil and chips.

A unique conveyor system composed of fourteen independent units allows production to continue even though one unit may be down for repairs. This is made possible by ample storage space which is integral in the system.

Should an interruption occur, production can continue for a period of time to the point of the breakdown. Beyond this point, engines can be automatically drawn from storage conveyor units at each of the key assembly locations on the line. Production then can continue beyond the breakdown point until the storage bank is exhausted.

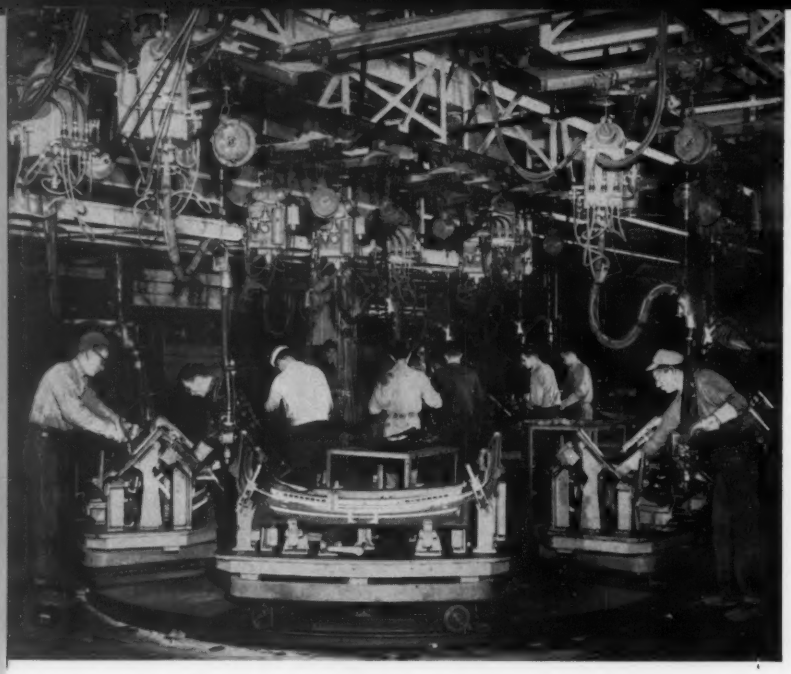


Fig. 6. The cowl tops pass through a series of spot-welding operations as they make the circuit on one of the plant's four "merry-go-rounds."

Flashing lights on the panel seen in Fig. 7 indicate what is happening over the more than a mile long conveyor system. A circuit for each of the fourteen units is contained in the panel. In the event of trouble anywhere along the line, a flashing light appears at the breakdown point and serves to alert the operator.

Selective assembly is speeded through a TelAutograph communication system. Inspectors stationed at the start of the assembly line use air gages to establish the exact sizes of the eight cylinders in each engine block. They also classify crankshaft dimensions. This information and the engine identification number are written by hand on the TelAutograph, which transmits them to a worker at the piston selector rack, to an inspector, and to a connecting-rod assembler.

Pistons are selected to match each bore in the block and hung on a conveyor rack. Inserts are put in the connecting-rods to size them to the crankpin measurements. These parts reach the assembly line shortly before the matching block enters the assembly station. When the right engine comes along, the matched set of pistons and connecting-rods is installed. The TelAutograph system makes it unnecessary to have large

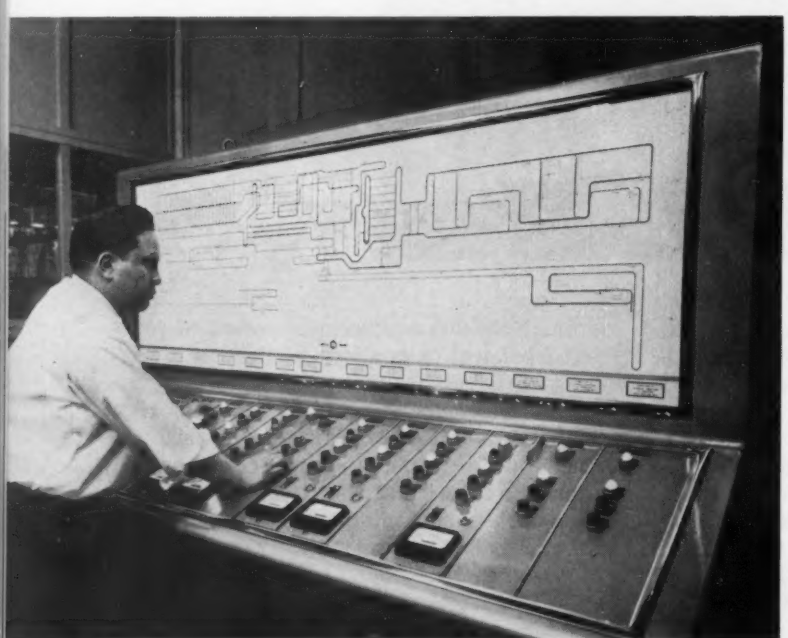


Fig. 7. This giant panel in the new engine plant immediately indicates by flashing lights any point of trouble along the entire conveyor network.

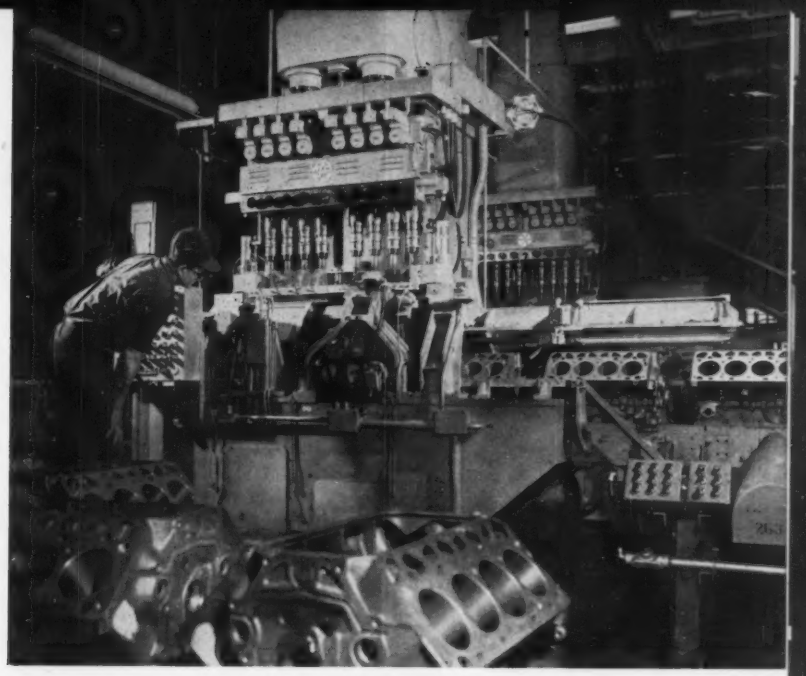


Fig. 8. Each bank of cylinders is honed in turn as the block traverses the two stations of the machine. Fixtures automatically tilt the blocks so that the cylinders are in a vertical plane.

stocks of various size pistons and connecting-rods alongside the engine assembly line and also reduces the possibility of any error in selection.

Two of the many engine-building activities of interest are shown in Figs. 8 and 9. In Fig. 8, blocks are shown going through a two-station honing operation on a Micromatic machine. At the first station, the block is tilted in one direction so that one bank of cylinders can be honed. At the second station, to which the block is subsequently advanced, the tilting is in an opposite direction for the honing of the other bank. Meanwhile, a new block is in work at the first station. The entire operation is directed from a push-button panel.

Crankshafts for Ford Fairlane V-8 engines are accurately balanced on the Tinius Olsen electronic machine appearing in Fig. 9. This machine determines the center and the amount of the imbalance, then drills holes in the counterweights. A control panel and a visual gage indicate to the operator when perfect balance has been obtained.

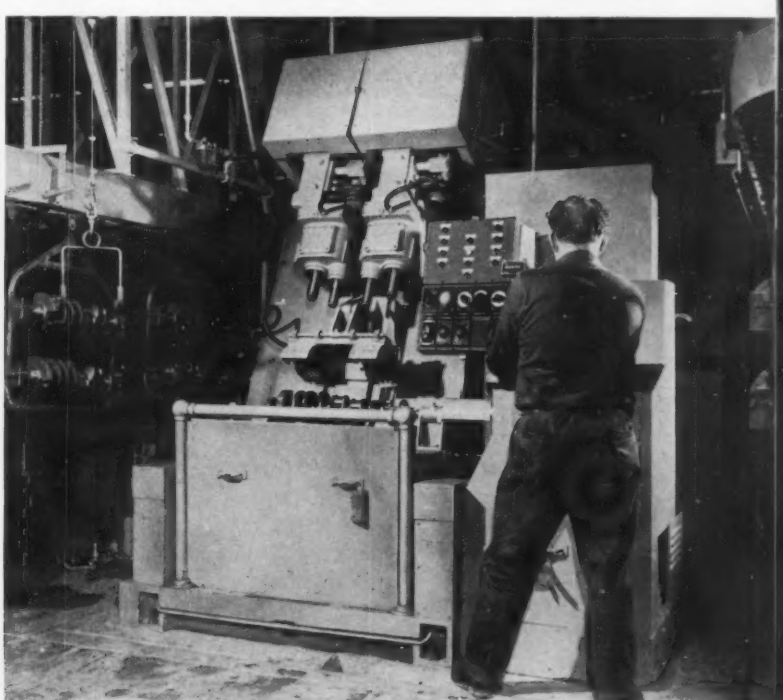


Fig. 9. To balance the crankshaft, this machine first determines the center and the amount of imbalance, then drills the counterweights a calculated depth.

Stretch-Forming Titanium Sections

By Ralph A. Kiehl, Tool Development Engineer
Convair Division of General Dynamics Corporation
San Diego, Calif.

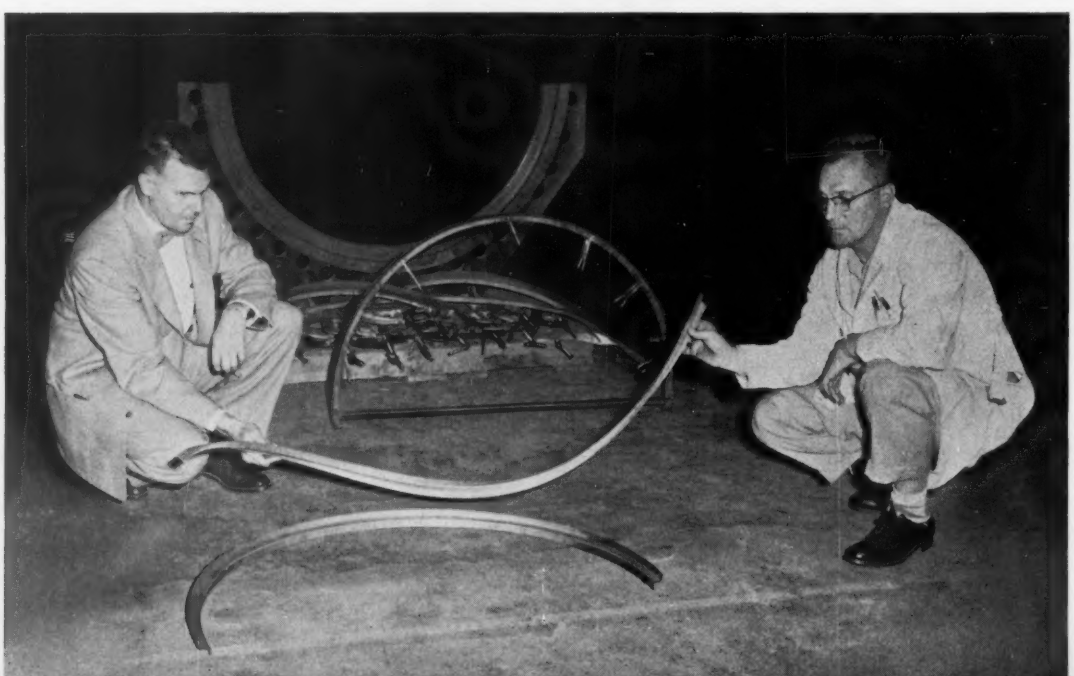
FABRICATORS of titanium alloy (8 per cent manganese) sheets have discovered that special treatment and careful attention to details are required if acceptable parts formed from this material by the stretch-wrapping process are to be duplicated. Production costs and the percentage of scrap have been lowered at Convair—San Diego by closely following procedures developed especially for titanium.

Stretch-wrap forming of preformed Y or angular sections of commercially pure or alloy titanium at room temperature is accomplished by applying similar procedures followed with one-quarter and one-half hard, tempered stainless steel. However, more all-round operative skill is essential due to the unusually limited plastic range of the material and, in the case of titanium alloy, because of its surface sensitivity and nonuniformity of elongation.

In addition to standard practice in normal stretch-wrap forming operations, the following procedure and precautionary measures are necessary for best results: First, the work-pieces should have machined or polished edges; the material should be carefully inspected for flaws and imperfections; and the part should be acid-etched prior to brake-forming. Tests have shown that the removal of a minimum of 0.002 inch of stock from each side of a part in a hydrofluoric-nitric solution reduces notch sensitivity and augments successful forming at room temperature. The solution used is 1 1/2 to 2 per cent hydrofluoric acid and 25 to 40 per cent nitric acid. The acid etching, which necessitates starting with thicker material, is considered a temporary measure to be discontinued when material can be obtained with a more satisfactory surface condition for stretch-wrap forming. Second, hardened jaws with sharp, clean serrations should be employed to uniformly grip the part in the stretch-wrap forming machine. Third, a heavy wire-mesh safety shield should be provided for the protection of the workmen.

Spring-back in work can be compensated for by over-forming on a stretch-block. The desired amount of over-forming should be determined from the spring-back exhibited by a sample part that has been stretched on the net stretch-form.

Fig. 1. When insufficient pressure is applied in stretch-wrap forming titanium alloys, severely twisted parts, such as the one held by the men in this illustration, are often obtained.



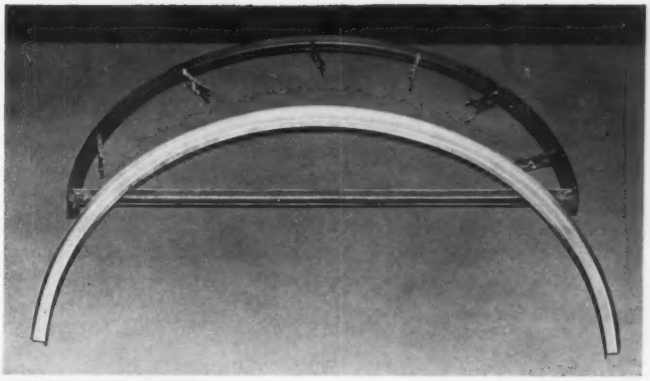


Fig. 2. (Right) Simplified heat-treating fixture of a type recently developed in the Convair—San Diego plant and a titanium section heat-treated in this fixture.

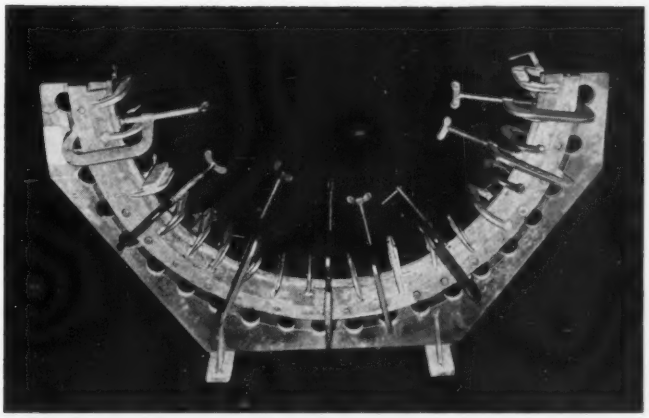


Fig. 3. (Left) Heavy type of heat-treating fixture which was previously used with a multitude of C-clamps for holding the work in heat-treating titanium stretched shapes.

It is Convair practice to record on the form the pressure required to stretch the part. If parts do not fit the net form-block satisfactorily after the operation has been performed, the dimensions of the material can be changed considerably by means of a stretcher-shrinker machine. Any stretching operation, however, should be performed before the final heat-treatment that relieves the tensional stresses and restores the compressive yield strength.

Other important measures to be observed in order to insure successful stretching of titanium alloy parts include maintaining a close dimensional control of all operations, inspecting the work after each operation, and stress-relieving parts after braking. In stress-relieving, parts are held at a temperature of 900 degrees F. for one hour. Parts not meeting inspection requirements after an operation can be detected in the early stages, and later troubles thus eliminated. When parts are stretch-formed, a close control of the pressure in hydraulic lines and a slow wrapping action are required. If insufficient pressure is applied, a severely twisted part may result—such as the one being held by the men in Fig. 1. In front of the twisted part is an acceptable piece of work.

If the foregoing precautions are taken, simplified heat-treatment fixtures, such as the one illustrated in Fig. 2, can be employed for successful stress-relieving, as compared to the heavy type of fixture shown in Fig. 3. The simplified heat-treatment fixtures save tool design and fabricating time and tooling materials. They also result in a substantial reduction in scrapped parts. In addition, the fixtures of simplified construction enable one man to load and clamp parts within the time formerly consumed by three men. One man replaces several previously required for loading and unloading the heat-treating furnaces.

Simplified fixtures enable better utilization of furnace space and result in higher heating efficiency. They are easily constructed from hot-rolled steel angles and flat plate rolled to the desired contour. The ends of the steel angles are connected with a bar, as seen in Fig. 2. Only a few small clamps are required to hold the part flat in the fixture during heat-treating operations in comparison with the multitude of large C-clamps necessary with fixtures of heavy steel construction. The C-clamps must be replaced periodically and steel bands or shoes are necessary with the heavy fixtures, in order to size the part in the fixture and to hold its shape during stress-relieving operations.

The upper portion of Fig. 4 shows the acces-

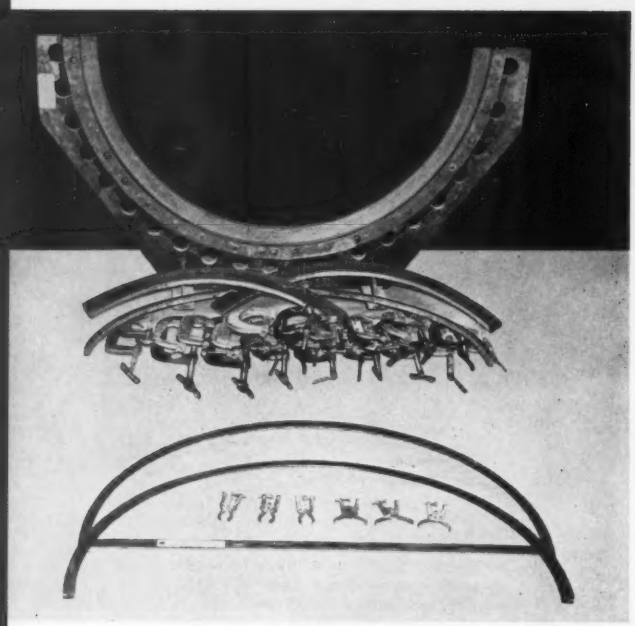


Fig. 4. Simple type of fixture with only a few grippers, now used for heat-treating operations, and in background, heavy type fixture with numerous clamps, previously employed for same work.

sories necessary with the heavy type of fixture. In the foreground is seen a simple fixture with a piece of work and the relatively few clamps required.

There are exceptions to the exclusive use of simplified fixtures. For example, heavy type fixtures with improved wedge type clamping features, replacing the C-clamps shown in the illustrations, are necessary for material 0.025 inch and less in thickness that has been severely strained (7 per cent or more). Considerable distortion will result in heat-treatment if such parts are not adequately held during the heating period. Heavy fixtures are also necessary in particular cases, regardless of gage, when comparatively low formability qualities, coupled with lack of proper control, will result in a high percentage of failures unless the parts are finish-formed to dimensions during the final heat-treating operation.

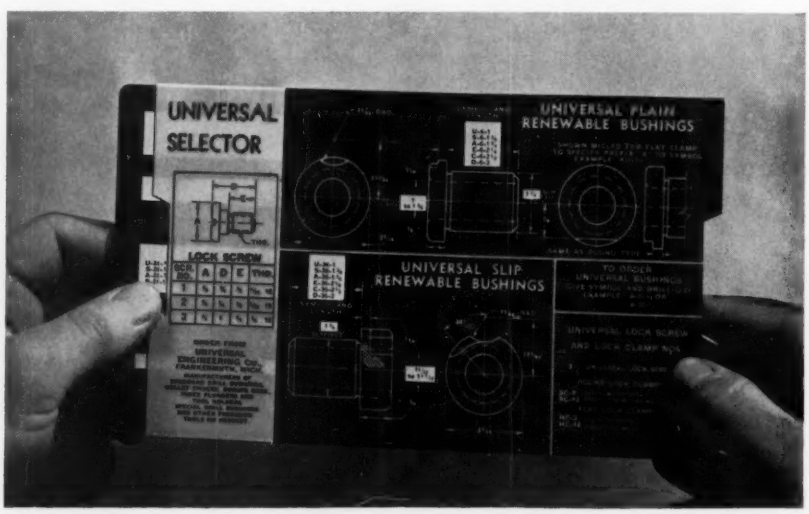
* * *

Slide Chart Simplifies Selection of Drill Bushings

A pocket-size slide chart that instantly selects the proper drill bushing for a given drill size has been perfected by the Universal Engineering Co. and is being offered, without cost, to engineers. The plastic slide chart represents six years of experiment by company engineers. It carries selection data for all types and sizes of drill jig bushings up to 1 3/4-inch drill size.

The selector is divided into four main areas, one for each of the four types of drill bushings. After noting the area pertaining to the desired bushing type, the slide is moved until the correct drill size appears in the drill-size window. All other important factors now appear in their proper windows. One window shows the correct outside bushing diameter and the dimension from the bushing center to the flat for clamping. Another window shows the radius necessary to accommodate a lock-screw.

Engineers writing on company letterheads, addressed to the Universal Engineering Co., Department H, Frankenmuth, Mich., can obtain one of the Universal Selectors.



By setting the slide of this Universal Selector to the desired drill size, all information pertinent to the selection of four standard type drill bushings will appear in the various windows.

Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Training Older Salesmen for Retirement

HOW many sales managers tutor the older employe during his latter years to accept retirement cheerfully and get the most out of it? If they do, disappointments and heartaches are avoided and the way is cleared for advancement of the younger sales employe.

The elderly sales engineer has usually an excellent record of past sales. Though loyal to the company, he may be inclined to disregard the need for new methods to meet changed markets. Having formed long-standing customer friendships, he is jealous of these connections and unwilling to wholeheartedly help a younger successor attain a position of influence in his own right.

This type of sales engineer, when facing retirement, may have no outside interests and retirement will come to him as a severe blow. Not only is he unhappy in the thought of retirement, but his dissatisfaction spreads to other employes. Such a situation could be avoided—to some degree—if sales management were to devote adequate attention to pre-retirement indoctrination and training.

Even though a policy of compulsory retirement has many advantages, it presents problems. The capabilities of each individual cannot be measured by years. Many men are alert and cooperative at sixty-five. Others, set in their ways, are obstinate and resist change. Such conditions point up the importance of pre-retirement training.

Tutoring the individual during the years preceding retirement can often avoid a critical personnel problem and help to build up sales department morale. How can the sales manager indoctrinate the older employe to gracefully accept retirement?

Here are some suggestions that may be of help.

1. Look ahead and spot the men whose age and length of service indicate a limited future in years. Next in importance to training younger men is training older employes to welcome retirement and also open the way for a successor.

2. Have frequent conferences with each older employe with the aim of getting him to recognize how valuable he can be in releasing his responsibilities to younger men.

3. Carefully select a cooperative younger person to work with the older employe and share his load. Many a young man succeeds through diplomacy and skill in getting the older man to act more in an advisory capacity.

4. Encourage the older employe to prepare for the break. Discuss his life after retirement, and the necessity of expanding his interests in other directions—emphasizing that complete rest in most instances soon contributes to a man's decline, rather than enriching his later years. The job of indoctrination should not be left solely to the company personnel specialists.

5. Gradually lighten the older man's load. For instance, if he is a field sales engineer, pave the way for him to settle at headquarters and help in training younger men, engage in market research, or undertake a staff job subject to special assignments.

6. Sometimes an old employe, who has difficulty in traveling, may be placed in a consulting capacity. Pave the way so that he will be consulted. Such a plan must be based on obtaining the cooperation of younger employes. There are many instances where an employe aged sixty-five or over has all the characteristics of further usefulness, and yet, retaining him on the regular payroll may engender criticism. In such cases, the man should be retained on a year-to-year basis to perform special duties.

7. Above all, diplomacy must be used in the treatment of older employes, realizing that everybody in time must retire. Keep older men satisfied, for their treatment reflects on younger employes.

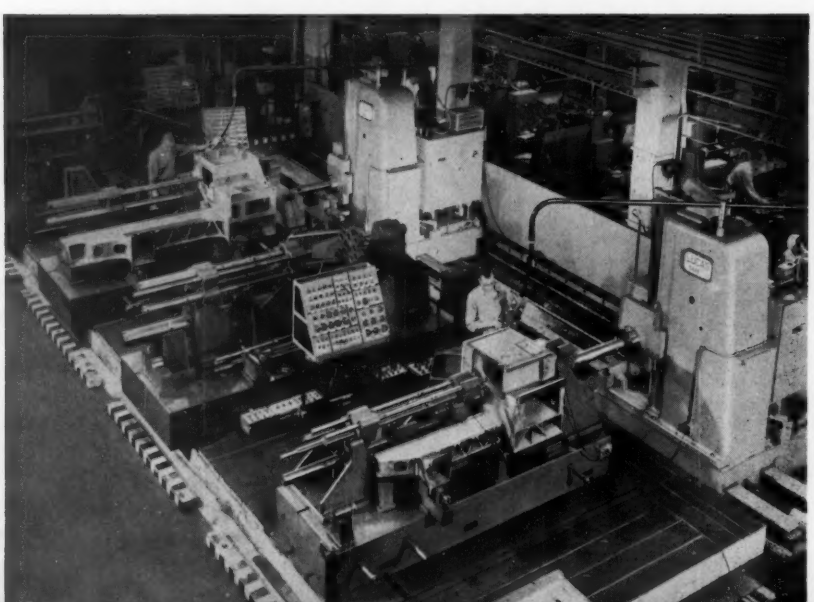
8. Keep in touch with the retired employe. Make him feel that he is still a part of the organization, and that his advice and suggestions are welcome.

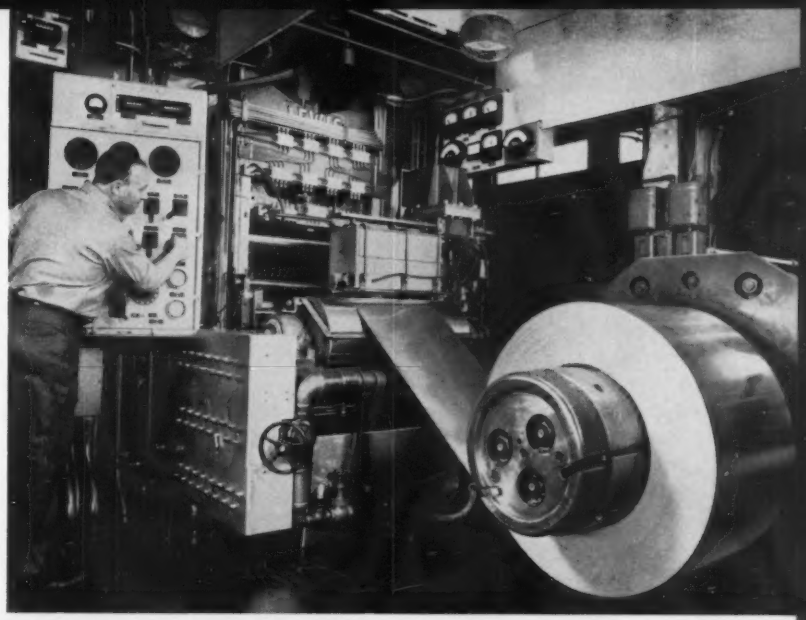
In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants

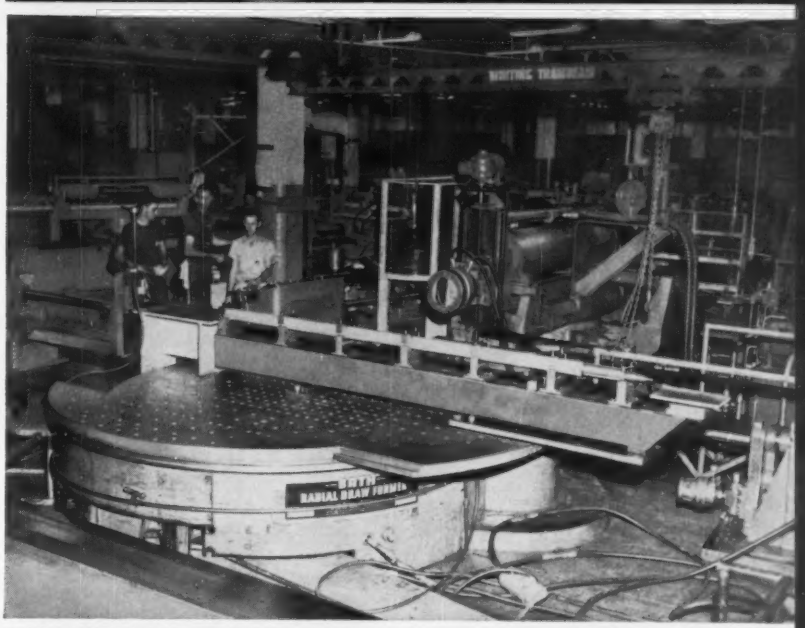
The world's largest milling machine undergoes final testing prior to installation at the General Electric Co., Schenectady, N. Y. Built by the Ingersoll Milling Machine Co., the machine can accommodate work 18 feet wide, 16 1/2 feet high, and 50 feet long. Two massive tables, which move over the 112-foot bedways, permit machining on one table and setting-up on the other at the same time. The machine will be used for large turbine-generator parts like the stator frame in the illustration.

Machining bed castings for saddle type turret lathes at the Warner & Swasey Co., Cleveland, Ohio, on a Lucas twin-column horizontal boring mill. The columns can be moved to four work stations, each having a permanently located fixture on a cast-iron table. Special tool boards at each fixture hold necessary carbide boring bits.





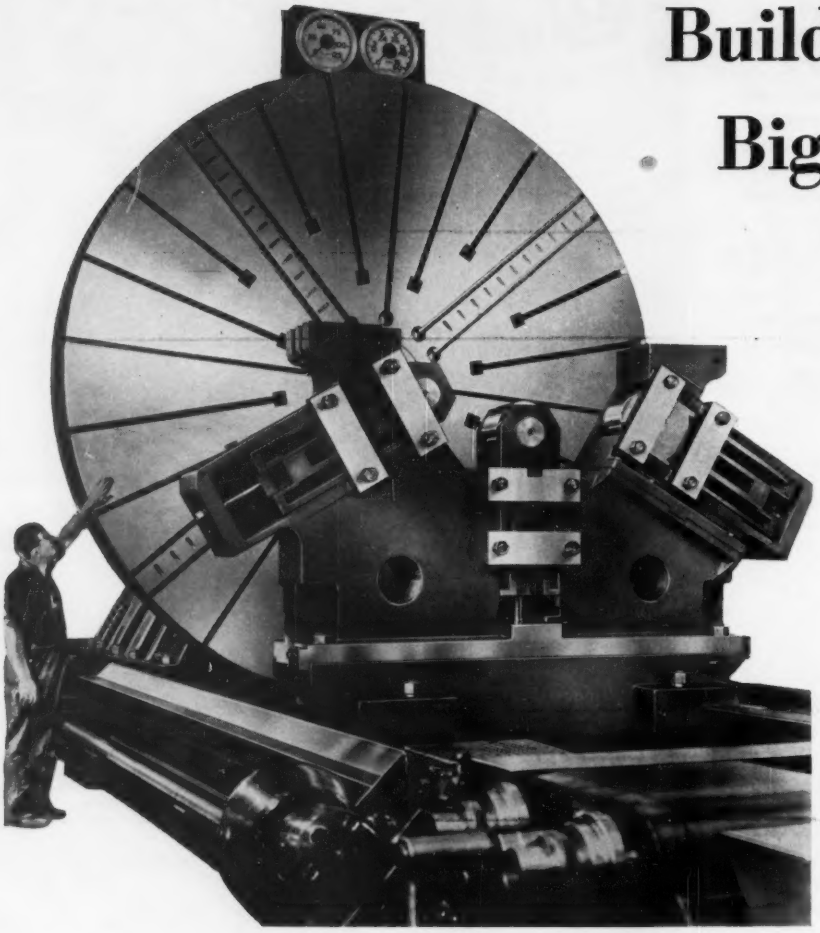
One of two new high-speed rolling mills at the Torrington, Conn., plant of the American Brass Co. The four-high reversing mills, built by the Lewis Machinery Division, Blaw-Knox Co., cold-reduce aluminum and copper-base alloys. Features include selsyns on the screw-down mechanism to indicate roll opening and an X-ray gage to measure strip thickness.



At Chance Vought Aircraft, Inc., Dallas, Texas, a Bath draw former serves as an internal broaching machine. The work is a 9-foot aluminum tube, and the operation consists of cutting flutes into the inside diameter. With the tube secured by a series of V-blocks, the broach is pulled through by a rod attached to the machine draw-head.

Straightening plate at the Lukens Steel Co., Coatesville, Pa., on a Clearing movable-head hydraulic flattening press. The first of its kind ever built, the press can exert a pressure of 5000 tons and handle steel plate 20 inches thick, 50 inches wide, and 14 feet long. Incorporated in the press bed are thirty-two pins to raise or lower the plate.

Building the Big Ones



By Robert M. Husband
Assistant to the President
Consolidated Machine Tool Co.
Division of Farrel-Birmingham Co., Inc.
Rochester, N. Y.

PAUL BUNYAN, legendary giant of the logging and lumbering industry, built a sawmill so large that its twin smokestacks were hinged at their middle so they could be lowered to let the clouds go by. The Bunyan legend makes no mention of the machine tools in Paul's maintenance shop, but of two things you can be certain: one, there were lathes in that shop and, two, they were big ones like the 12-foot heavy-duty Betts lathe recently built by the Consolidated Machine Tool Co.

This is a half-million-dollar lathe that swings 12 feet over the ways and takes work up to 60 feet long between centers. Big forgings weighing up to 250 tons can be machined on centers alone. This lathe weighs over 240 tons and its headstock will transmit 250 H.P. from the driving motor to the spindle. The heaviest and most powerful general-purpose lathe ever built in America, it will be used for machining huge generator and turbine forgings.

Big machine tools like this one are not made on assembly lines nor are they off-the-shelf package items like Maxwell House coffee. They are built to order. Many of them are entirely special and must be completely engineered. Even if they are more or less standard, they often require many engineering and pattern changes. In nor-

mal peacetime manufacturing when shop schedules are not too heavy, they require from a year to a year and a half to build.

Designing and building such big tools present problems not encountered in building smaller machines. One such problem is the weight of the work-piece. With a 36-inch or 48-inch lathe, the weight of the work is not an important consideration. But on a 12-foot lathe it becomes a dominant design factor. The machine has to take forgings weighing up to 250 tons on centers alone for the simple reason that these forgings must be spot-turned before steadyrests can be used to support the work.

This 250-ton work load spelled out the size of the headstock spindle and the diameter of its huge super-precision spherical roller bearings. It also determined the size of the tailstock spindle and its big super-precision roller bearings. And it went farther—it eliminated completely the conventional taper shank centers in the headstock and tailstock spindles. Only shoulder type bolted-on centers will operate under such load conditions.

In the entire category of big lathe work, it is doubtful if there is anything requiring higher accuracy than turbine and generator parts which rotate at high surface speeds and have little clearance between moving and stationary parts. High accuracy, therefore, was another factor affecting the design and building of this big lathe. The spindle run-out was held to less than 0.0005 inch. Admittedly, this is not astonishing accuracy on small lathes, but less than 0.0005 inch on a spindle that carries a 12-foot faceplate weighing 20 tons presented problems calling for special engineering consideration and shop work of extraordinary character.

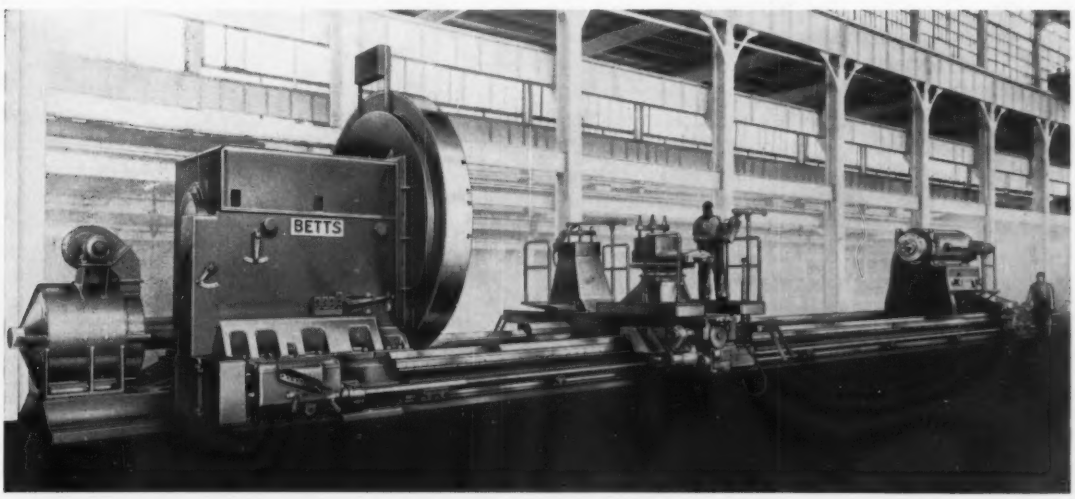
Work-pieces 40, 50, and 60 feet long introduced the problem of linear expansion due to temperature rise within the work itself. There has to be some place for increased length to go. The answer is a tailstock preloaded in the line of pressure by big dished disc type Belleville springs.

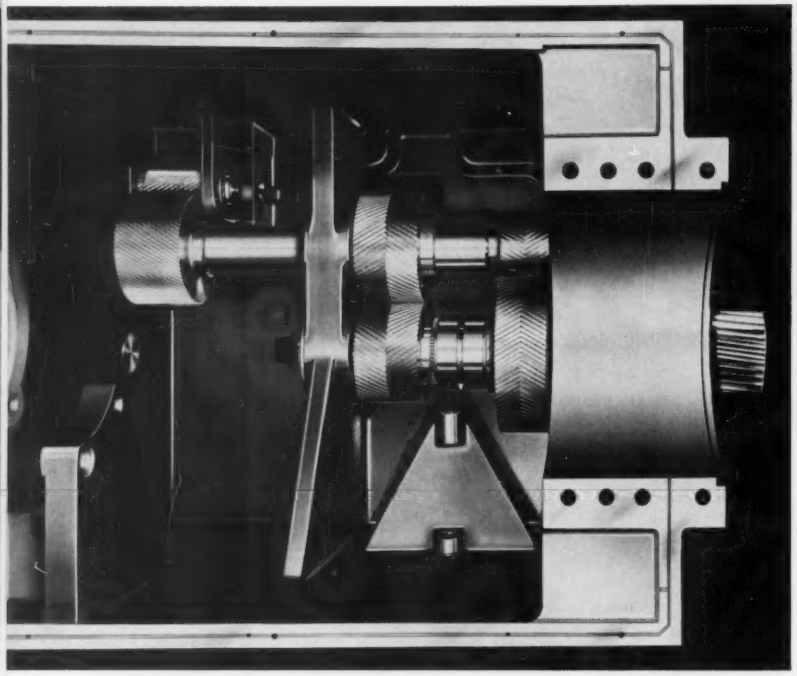
On certain operations, a customer has to turn tapers up to 14 feet long in one setting. To meet this requirement, a taper attachment has been provided that is so large it has to be positioned by a motor-driven pinion and a rack on the side of the bed. A 14-foot taper at even modest angles requires a taper attachment so wide that outriggers with roller bearing wheels and a track in the foundation were provided to take care of the overhang. Big machine tools mean big cutting tools. Cuts are deeper and feeds coarser, for there is more stock to take off. Bigger tools mean heavier tool pressures and larger driving motors.

This lathe has a headstock 8 feet long, 7 feet wide, and 8 feet high—big as an ordinary sized bathroom. Now imagine a headstock with twenty-four changes of spindle speed through selective sliding gears that transmit 250 H.P. Some of the gears would be too large to shift easily by hand. So, the lathe was provided with a variable-voltage direct-current motor drive having a 20 to 1 speed range and one simple 3 to 1 mechanical shift (a gear type clutch) that give infinitely variable speeds through an over-all range of 60 to 1.

Variable-voltage direct-current drives with their motor-generator sets and controls are

Mammoth-sized lathe of 12-foot swing and 80-foot length. Carriage equipped with front and back tool-rests and push-button panel for controlling operation





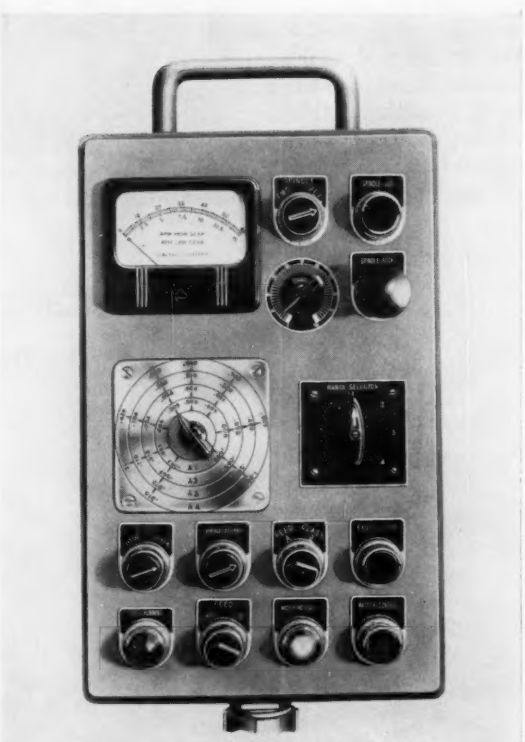
View of the headstock showing the comparatively few gears required for driving the spindle at infinite number of speeds within its range

costly, but the elimination of a lot of big gearing, shafts and bearings, shifting mechanisms and hydraulic equipment cancels much of the cost. Certainly, with variable-voltage drives, there is less to wear and to maintain.

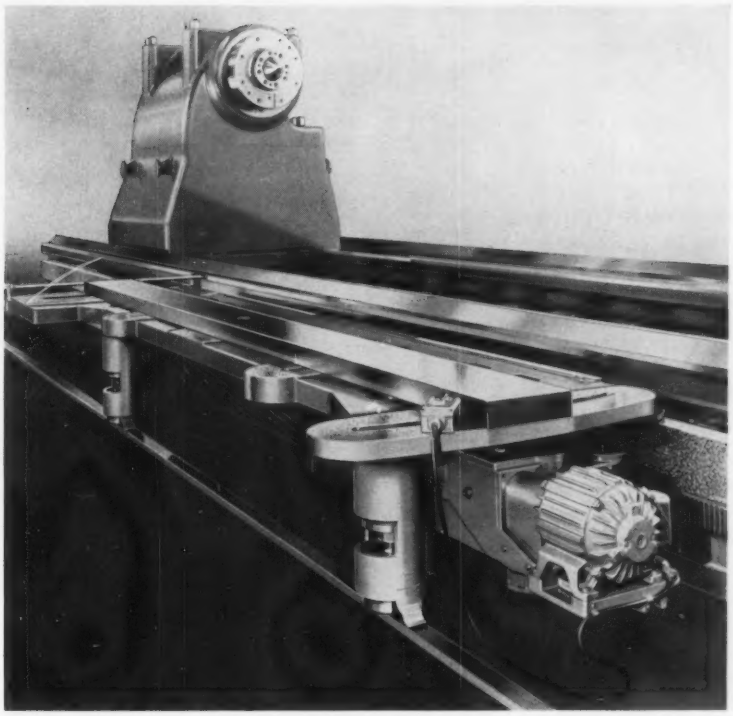
But the biggest gain of all—the one that outweighs all others—is the fact that this variable-voltage, direct-current drive lets the operator control his cutting speed at the cutting tool. He can adjust his speed up or down in fine increments while the tool is cutting to get maximum metal removal or optimum finish. There are two big dials above the faceplate to guide him: one that indicates the R.P.M., and the other, the percentage of motor load.

From the same control panel, the operator selects feeds, right or left and in or out. Electronically controlled, he can adjust them up or down in fine increments while the tool is cutting. Directional power-traverse of the carriage and the tool-rest are also at his finger tips. (A second lathe of the same dimensions, except for a greater swing, which is less general purpose in character, has also recently been built by Consolidated. This machine, too, is being used on big turbine and generator work.)

The procurement of outside purchased materials and components for big machine tools can often be a major headache. Chief among them is the electrical equipment. The bigger the machine



Push-button panel provided on the carriage to enable operator to run machine from position adjacent to cutting tools



Motor-positioned taper attachment for cutting tapers up to 14 feet long in one setting. The attachment must be supported by outriggers

tool, the more complex the electrical equipment. This is becoming increasingly so as more and more functions are being performed electrically. For example, Consolidated builds big vertical boring and turning mills without a single gear-shift lever. Push-buttons on pendant switches operate magnetic clutches in the gear-boxes instead.

All of the electrical units are custom built. They require a great amount of engineering lay-out and building time. Like the big machine tools, they too, are long lead-time items; but you cannot run 12-foot lathes at the cutting tools or 42-foot vertical boring and turning mills from pendant switches without them.

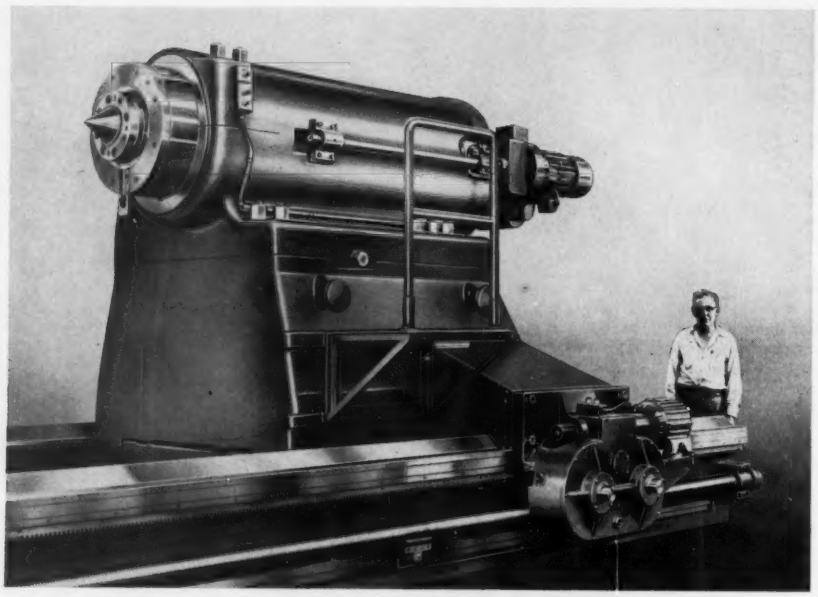
Big pit-molded castings can produce problems if they have to be poured in outside foundries and big weldments, too, when there is a shortage of rolled steel plate. The extent and intensity of the procurement headaches depend on the volume of orders already on suppliers' books.

Big machine tools must be designed for rail shipment, or the builder will find himself in a worse predicament than the man who built a 30-foot cabin cruiser in his basement. Long lathe beds, planer beds, and the runways for floor type horizontals must be made in sections. The tables of large vertical boring and turning mills must be constructed in two or three pieces and fitted together. Abutting ends of such components must be machined to extreme accuracy. Large keys or integral tongues and grooves, and big dowels bring the sections into accurate relationship with each other when the machine is finally assembled on the customer's foundation. Long lead-screws are made in sections. The sections have male and female joints and are pinned in place with dowels prior to threading.

Castings and assemblies must come within size limitations of 12 feet wide by 15 feet high for shipment. A few inches may be gained on these dimensions, depending on the railroad handling the shipment. The maximum length of parts depends on the length of the railroad cars. Standard flat cars run from 40 to 53 feet long. But 10 feet (5 feet at each end) must be deducted for blocking. Bed sections, as a rule, do not exceed 30 feet in length. They can be shipped on any flat cars that happen to be available. For the 12-foot lathe, six flat cars were used, one for each bed section and three for assembled units.

The load-carrying capacity of standard flat cars ranges from 30 to 70 tons. Big machine tool parts rarely exceed this weight limitation, but when they do, cars up to 250 tons in capacity can be had. These are well or drop-center cars with special wheel arrangements for distributing the load over track and structures. They increase the height limit by 2 or 3 feet but at the same time, they reduce the length of the piece that can be shipped.

Another factor in building big machine tools



Thirty-ton tailstock with motors for movement along the bed and in-and-out positioning of center. It is preloaded in the line of pressure

that must be taken into account is the builder's own machine tools. After all due allowance for Yankee ingenuity and jury rigs in the shop, what the builder can do is finally dependent upon the size of his own machine tools and cranes.

At Consolidated, a recent two-million-dollar big-tool expansion program removed these limitations or at least thrust them into the future. But how far into the future is anyone's guess, for the frontier of machine tool bigness is always shifting. Today's giants become ordinary sized tomorrow.

* * *

Color-Anodized Aluminum Available in Many Forms

Fabricators may now obtain aluminum in all colors of the rainbow according to the Aluminum Company of America, Pittsburgh, Pa. Blue, green, yellow, gray, brown, gold, and black metallic finishes—and shade variations thereof —can now be ordered on sheet, extruded shapes, rod, and bar, as well as on drawn and extruded tubing. Bright, metallic-colored aluminum will be more readily adapted for such things as lawn furniture, building panels and siding, automotive trim, store fronts, and aluminum doors. Train and bus exteriors, automobile tops, appliances, handrails, and storm windows offer other good potential applications.

The color finishes on the aluminum are actually part of the metal itself. The crystal-clear, diamond-hard oxide coating is artificially built up and colored with special dye materials and then "sealed-in," becoming an integral part of the metal. Two general classes of color-anodized finishes are available. These are Alcoa's Decorative Color Finish and Alcoa's Architectural Color Finish.

The decorative color finishes are designed for both interior and exterior application. The architectural finishes are designed primarily for hard-weathering exterior service. Both general classes are supplied in all extruded forms and in flat sheet, including pattern sheet. The decorative finishes are also supplied in coiled sheet.

* * *

Ultrasonic Manufacturers Association Formed Recently

Formation of the Ultrasonic Manufacturers Association has been announced by its newly elected officers and board of directors. Organized by the leading manufacturers in this field, the U.M.A. will promote dissemination of data about ultrasonic equipment and its applications.

The officers of the Association are: president, W. C. Potthoff, vice-president, Aeroprojects, Inc.; vice-president, Stanley R. Rich, technical director and vice-president, General Ultrasonics Co.; secretary, Norman Branson, president, Branson Instruments, Inc.; and treasurer, Jack Welch, general manager, Machine Tool Division, Sheffield Corporation.

INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

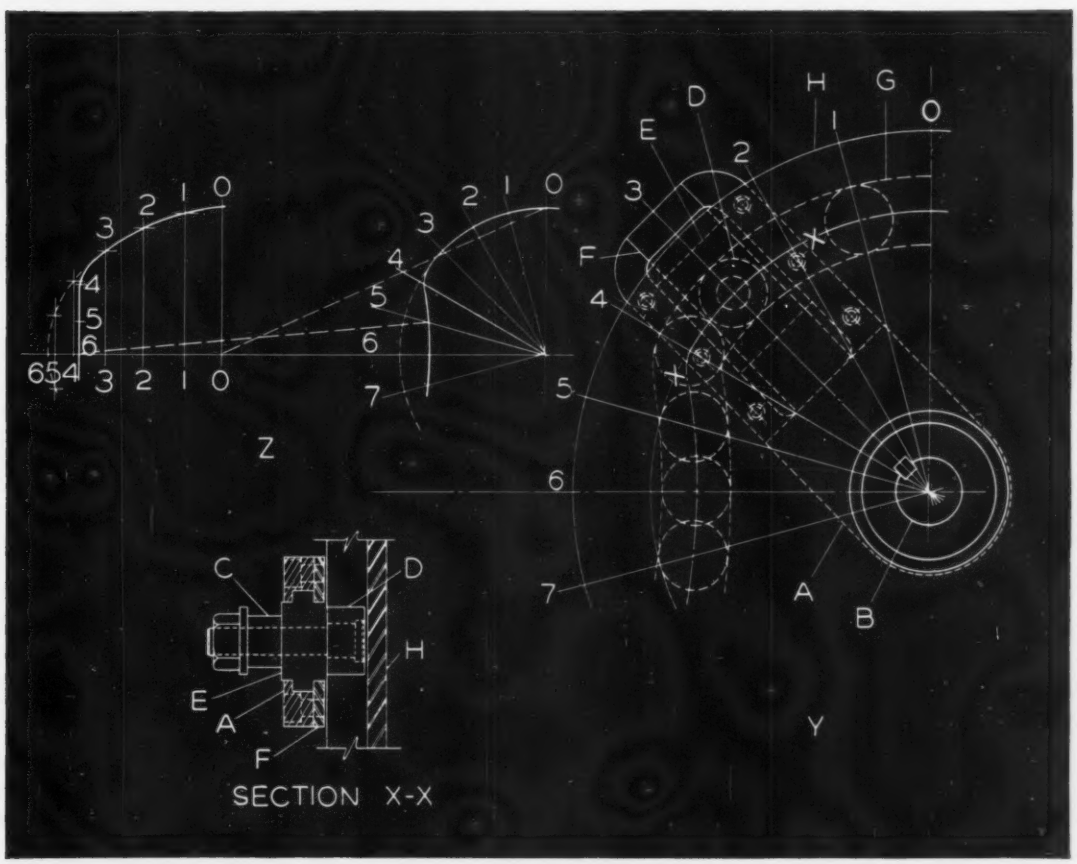
Rotating Crank that Provides a Dwell in Reciprocating Motion

By H. B. SCHELL, Brooklyn, N. Y.

In a certain mechanism it was necessary to obtain a reciprocating motion with a dwell period at one end of the stroke. This was accomplished by designing the crank and cam mechanism shown in the accompanying illustration.

The device consists of a crank rotating in the usual fashion but with its crankpin arranged to move radially in a slot provided in the crank-arm. Used in connection with a suitable stationary cam, a cross-head driven by a connecting-rod can be made to follow many different modifications of the reciprocating crank movement. Although the cam-follower in this case is located on the center line of the crankpin, it can be located to suit operating conditions.

Crank *A* is keyed to shaft *B*. Crankpin *C* and



Rotating crank and cam mechanism produces dwell in reciprocating movement

cam-follower *D* are arranged to move radially with a block *E* which slides in a slot in the crank-arm. The block is retained in the crank-arm by gibs *F*. The cam-follower and crankpin are secured to block *E* by means of a screw and nut, as shown in cross-section X-X of the assembly.

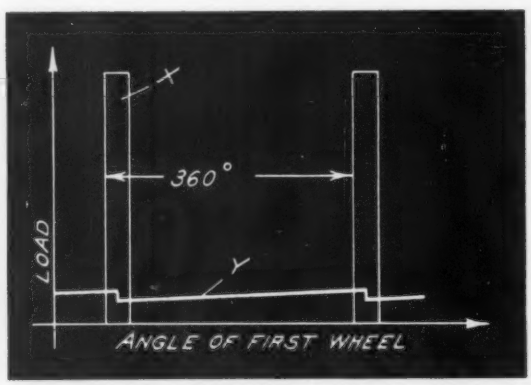
The reciprocating motion with a dwell is obtained when cam-follower *D* moves within a recessed cam-groove *G* in a stationary plate *H* during the swing of the crank, as indicated in view Y. By referring to the diagrams showing the movement of the crank device, view Z, it will be apparent that when the follower *D* passes points numbered 0, 1, 2, and 3, the driven member will follow the normal crank-arm arc. However, since the path through points numbered 5 and 6 is concentric with the point at which the connecting-rod is attached to the cross-head or other reciprocating member, no horizontal movement can occur as the cam-follower moves through this portion of its path. In diagram Z, the diagonal dotted line between points 0-0 and the dotted line between points 5-6 represent two positions of the connecting-rod.

Since part of the horizontal movement of the driven member is lost at the dwell portion of the cycle, the length of the crank-arm radius must be suitable for the desired total movement. The transition from movement to dwell period can be varied to suit conditions.

Counting Device for High-Speed Operation

By B. J. POPPER, Kfar-Ata, Israel

Counters have been required for various applications such as on computers, servo mechanisms, and other similar devices that function at high speeds. Under such usage, the counting unit must impart an absolute minimum of drag, or shock load, to the driving members.



A conventional low-speed counter, operating with an intermittent motion, builds up momentary shock loads during normal cycling, as can be seen in the graphic illustration at X, Fig. 1. As the operating speed of this type counter increases, so does the acceleration and, as a consequence, the load. This increased load is dissipated in the form of either elastic or plastic deformation of the counter mechanism. Even if the preferable case of elastic deformation should result, the driving mechanism to which the counter is attached is liable to suffer from the shock of being momentarily halted or rapidly decelerated.

To overcome these problems associated with high-speed operation, ranging up to 12,000

Fig. 1. (Above) Load distribution of conventional counter (X) as compared to the load distribution (Y) of the high-speed counter shown in Fig. 2.

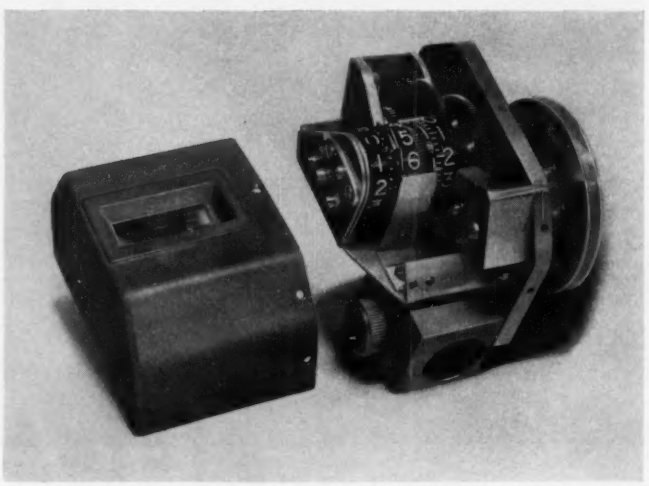


Fig. 2 (Right) Counter device designed for high-speed operation in applications where smooth, shock-free functioning is necessary.

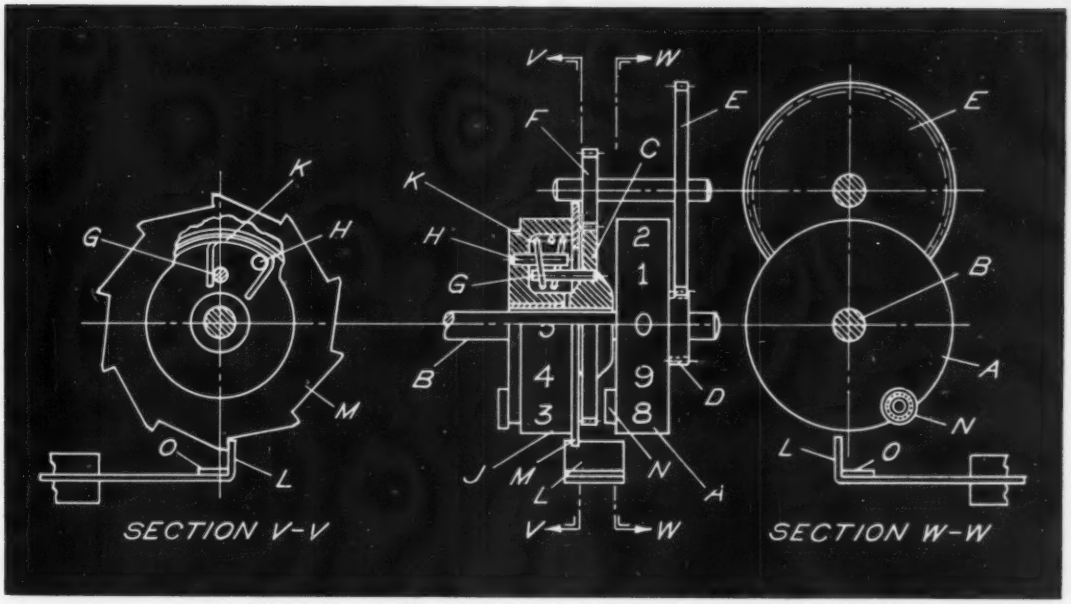


Fig. 3. Spring-loaded wheel (J) jumps forward one number for each complete revolution of wheel (A).

R.P.M. and with a load of approximately 1 ounce-inch, the counter mechanism illustrated in Fig. 2 has been developed. Wheel *A*, which can be seen in the diagrammatic representation of the counter, Fig. 3, is keyed to input shaft *B*, thereby making one complete revolution for each made by the shaft. Gear *C*, which rotates independently of the input shaft, is driven at one-tenth the speed of wheel *A* by the action of reduction gears *D*, *E*, and *F*.

Pin *G*, projecting from the hub of gear *C*, and pin *H*, projecting from the bottom of a recess in wheel *J*, engage the bent ends of spiral spring *K*. As gear *C* rotates, wheel *J* tends to rotate in unison through the spiral spring linkage. However, movement of wheel *J* is prevented by pawl lever *L* which engages a tooth of ratchet wheel *M*. The ratchet wheel is attached to the counter wheel. While in this position, energy necessary to turn wheel *J* is being built up in a potential form in spring *K*.

A small ball bearing *N* is mounted on the left-hand face of wheel *A*. Once during each revolution of this wheel, the ball bearing contacts pawl lever *L*, depressing it momentarily. This frees wheel *J*, which then rotates one-tenth of a revolution under the influence of the spiral spring, until its movement is once again arrested by the engagement of the pawl lever with the ratchet wheel. In this way, a comparatively even load distribution, as shown graphically at *Y* in Fig. 1, is obtained. This advantage is not lost under high-speed operating conditions.

Normally, there is no difficulty in reading the numbers when the mechanism is operating in its proper direction, as all numbers except those on wheel *A* snap into view the instant "9" of the preceding wheel changes to "0." If the counter is operated in the reverse direction, however, the numbers will no longer swing into position but will move continually. At higher speeds the numbers on wheel *A* are no longer readable. A small weight *O*, attached to the pawl lever, retards return of the pawl to the ratchet wheel, thereby smoothing out the movement of wheel *J*. It is then possible for the operator to satisfactorily interpolate the readings of this wheel.

* * *

Process for Marking and Coating Stainless Steel

A process for permanently coating and integrally marking the surface of stainless steel has been announced by Ateenate, Inc., Boston, Mass. The Ateenate surface-processing technique, utilizing a new photo-chemical process, produces a hard, highly ductile, non-crystalline structure. Since it actually alters the chemical composition of the steel, the markings and coating become an integral part of the metal. The process is effective on metals with a minimum chromium content of 11 per cent and will permanently mark stainless steel in jet black. It is said to produce a coating that increases the strength of the metal, provides a much smoother surface, and reduces friction and heat.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Synchronized Quad Vernier Dividing Head

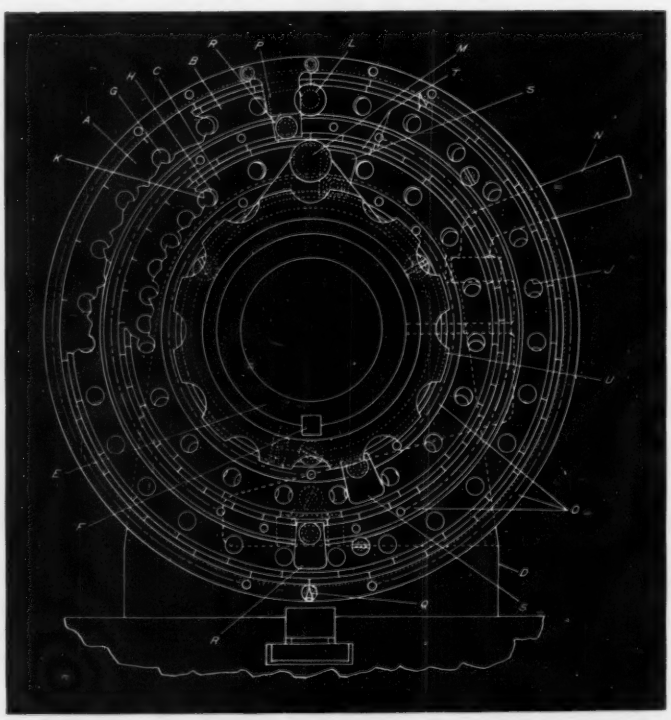
By J. R. HANSEN, Bellevue, Wash.

As many as 3,577,772 divisions can be obtained from a universal dividing head having a total of only 179 index control positions. The mechanism, which is patented, is unique in that it is gearless, employing, instead, three discs adjacent and concentric to each other. Hole-circles are accurately located on the discs to form two vernier-matched pairs of stop positions, so proportioned that the output of one pair serves as the vernier for the other pair, in this way producing millions of divisions. The center disc, called the *control annulus,* is of a differential nature, except that there is no reverse rotation.

One of the problems of dividing has always been that of distributing the leftover digits of uneven divisions. This drawback has been eliminated almost entirely by the extremely large common denominator that the control annulus helps to produce. The infinitesimal size of the divisions possible delays decimals of leftover digits from accumulating so rapidly that they must be spread often to maintain working tolerance.

A drawing of the dividing head is shown in the accompanying illustrations. The three discs referred to are: back disc *A*, control annulus *B*, and front disc *C*. The headstock *D* supports the hollow spindle *E* on which is secured a chuck or faceplate (not shown). The spindle is feathered by key *F* to the front disc, which is free to turn, as is the control annulus. The back disc, however, is fixed to the headstock casting by screws and dowels, and cannot turn.

Both back and front discs have single hole-circles, *G* and *H*, respectively. In the control an-



End view (left) and side view (right) of synchronized quad vernier dividing head. Three discs of hole-circles acting as verniers on each other replace the gear train of the conventional head.

nulus, there are two hole-circles—circle *J*, equal in diameter to circle *G;* and circle *K*, equal in diameter to circle *H*. Plunger *L* locks the control annulus with the back disc, and plunger *M* locks the front disc with the control annulus. When the head is in use, strain is kept from the plungers by locking the spindle directly to the headstock with the clamp *N*.

The 179 index control positions are provided for by the following hole-circle combination: back disc, 61 holes; control annulus, 31 holes (outer circle) and 43 holes (inner circle); and front disc, 44 holes. For clarity, a reduced number of holes is represented in each of the various circles in the drawing.

Three pairs of sector arms, used conventionally, indicate hole positions forward for the plungers. The arms are secured, by knurled screws, to a ring *O* of tapped holes located in a groove near the periphery of each disc. Arm *P* and pointer *Q* span the back disc; arms *R*, the control annulus; and arms *S*, the front disc. A change of setting is made by moving the arms to different tapped holes in their respective rings. The number of tapped holes in each ring corresponds to the number of stop positions.

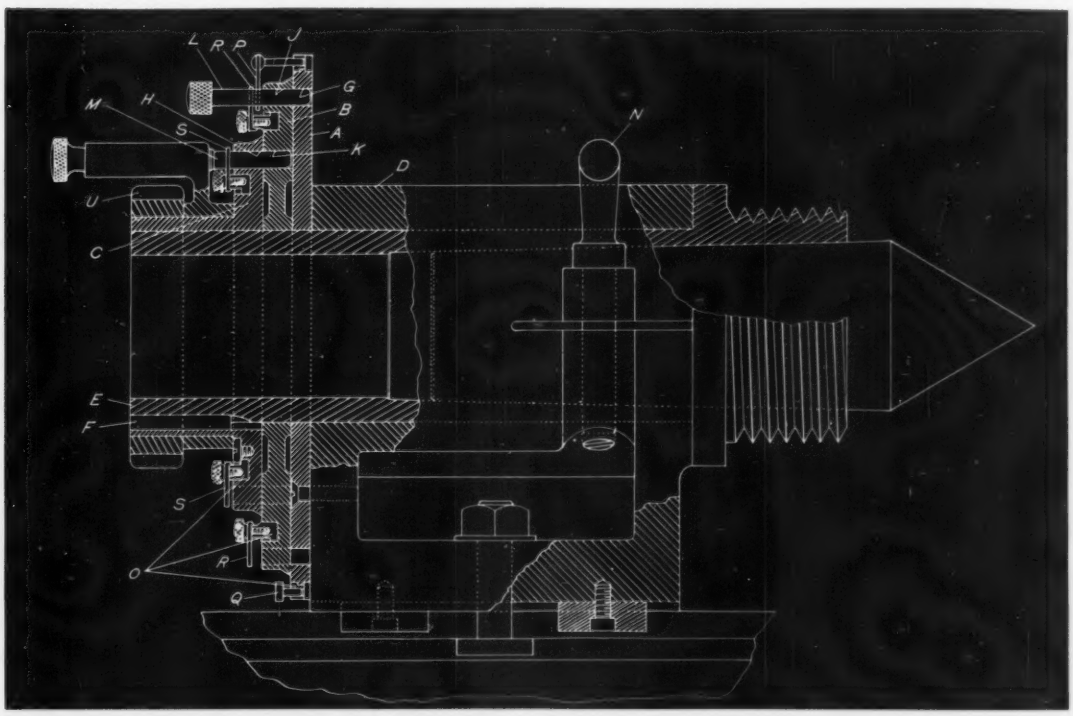
Other features of the dividing head are two sets of vernier lines *T*—the quad vernier—to assist in setting the index holes to coincidence and a fluted wheel *U* for turning the spindle. While the device is of the "direct" type in that no gears are required, it can, if desired, be adapted to function through a conventional gear-reduction train.

The outer, 31 hole-circle of the control annulus is the vernier mate to the 61 hole-circle of the back disc. The difference fractionally across any adjacent 2 of the 61 spaces and 1 of the 31 spaces is 1/1891. This is the fractional forward movement of the control annulus when plunger *L* is transferred from one side to the other of the two slightly different angles—$2/61 - 1/31 = 1/1891$.

The inner, 43 hole-circle of the control annulus is the vernier mate to the 44 hole-circle of the front disc. The difference fractionally across 1 of the 43 spaces and 1 of the 44 spaces is 1/1892, the apparent reverse movement made by the front disc and spindle relative to the control annulus. This fractional rotation takes place when plunger *M* is transferred from one side to the other of the two slightly different angles—$1/43 - 1/44 = 1/1892$.

Problem I: Divide the angle 1/3,577,772

A possible way of obtaining this division would be, first, to reverse the front disc 1 hole (1/1892) relative to the control annulus by means of plunger *M;* and, secondly, to advance both the front disc and the control annulus one hole (1/1891) relative to the back disc, by means of plunger *L*. The difference between the advance and reverse (1/1891 — 1/1892) is 1/3,577,772,



the net gain in rotation of the front disc and the spindle.

Another sequence of movement is preferred, however, since it avoids reverse rotation. When using it, both plungers still contact the same index holes as before. In this instance, plunger *M* is released from the control annulus and advanced 43 holes, with the aid of the appropriate sector-arm pair, around the front disc. Plunger *L* is then released and advanced 1 hole in the 31 hole-circle of the control annulus. Next, by pressing down and forward on the plunger, it aligns itself with the next hole in the back disc. Finally, plunger *M* is pressed down and forward until it aligns itself with the next hole in the control annulus. The division is now completed.

There are three basic angular measurement sizes in descending order, like degrees, minutes, and seconds: 1/61, 1/1891, and 1/3,577,772. As stated previously, the value 1/3,577,772 represents the difference between the secondary angle 1/1891 and an arbitrary angle 1/1892. Thus, computations must include the digit number of 1/3,577,772 "micro" units and the digit number of 1/1891 "secondary" units. In other words, for each 1/3,577,772 unit represented, one digit must be added to the number of digits representing the 1/1891 units.

Problem II: Displace the angle 1895/3,577,772

This angle is equal to the sum of 1/1891 and 3/3,577,772. There is a total of four digits, and the setting consists of moving plunger *L* 4 holes in the 31 hole-circle of the control annulus and moving plunger *M* 41 holes (44 − 3 = 41) in the 44 hole-circle of the front disc.

Problem III: Divide the prime number 157

Dividing 1891 by 157 gives a quotient of 12 secondary units and a remainder of 7 secondary units each equal to 1892 micro spaces, or a total of 13,244 micro spaces. Then, dividing 13,244 by 157 gives a quotient of 84, the micro-unit displacement, plus 56 leftover micro-unit digits. The 84 micro units are displaced by 1 hole on the 43 hole-circle of the control annulus and 40 holes on the 44 hole-circle of the front disc (84/44 = 1 plus 40 remainder). The sector arms *S* for the front disc are set to span 4 (44 − 40 = 4) holes according to the principle established in Problem I.

To obtain the displacement on the 61 hole-circle of the back disc and the 31 hole-circle of the control annulus, the 84 digits of micro units are added to the 12 digits of secondary units, for a total of 96 digits. These are displaced by 3 holes on the 61 hole-circle of the back disc and 3 holes on the 31 hole-circle of the control annulus (96/31 = 3 plus 3 remainder). The sector arm *P* and pointer *Q* for the back disc are set to span 3 holes, and sector arms *R* for the control annulus are also set to span 3 holes.

One of the main advantages of the 3,577,772-division capacity of the dividing head can be appreciated from the manner in which the 56 leftover digits are spread. The usual 400,000-division capacity head will require 56 corrections to spread a 56-unit leftover. But with each division of the new head only one-ninth the size, the 56 digits are spread in groups of 9, using only 6 corrections (6 × 9 = 54). After each of the 26 (157/6 = 26) divisions, an addition of 9 (9/3,577,772) micro divisions is made.

The control positions can be stopped in coincidence by means other than mechanical with plungers as described. They can be stopped by visual comparison, or by electromagnetic or electronic positioning devices. The head operates either clockwise or counter-clockwise with equal facility.

Tapping Fixture for Die-Cast Part

By W. M. Halliday, Southport, England

Tapping the blind cored hole of a small die-cast bracket was simplified by a special quick-loading fixture. Because of the shape of the work, it could not be held satisfactorily in an ordinary vise.

In the illustration, view X is an enlargement of the bracket. The hole *A* to be tapped is located in one end. The base *B* is flat, but all five sides *C* are tapered, thus complicating the problem of holding. A slot *D* is cored centrally in the base and extends three-fourths the length of the part.

In the drawing of the fixture, view Y, the part is shown in position for tapping. The body *E* of the fixture is fastened to a baseplate *F*, in turn, bolted to the machine table. In a shallow step on the top of the body is a register-plate *G*. This plate projects over the left-hand side of the body.

Integral with the underside of the projecting portion of the plate is a T-shaped tongue, shown separately in view Z. This tongue comprises a narrow portion *H*, having a width 0.005 inch less

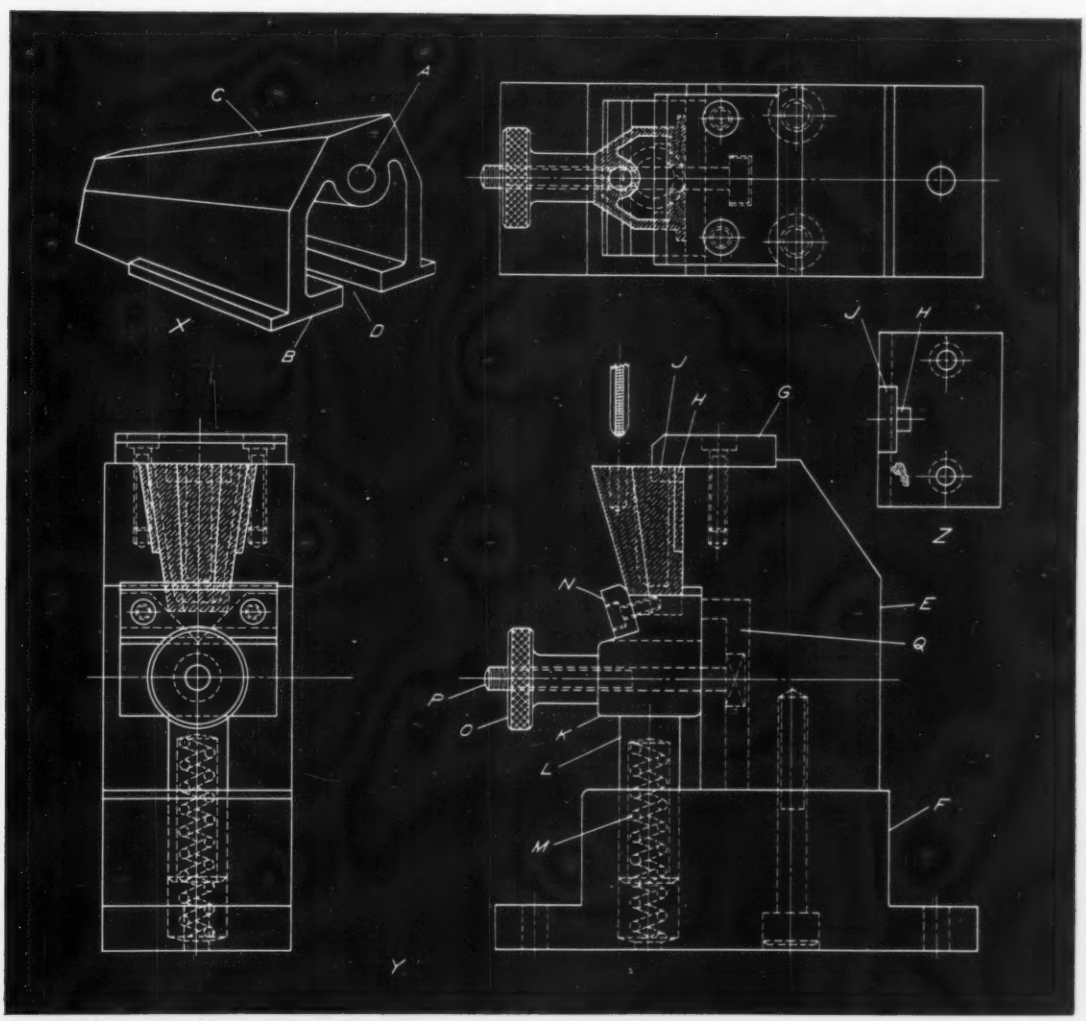
than that of the slot *D*, and a lip *J* that is relatively shorter and engages the hollow interior of the die-casting. The tongue is immediately adjacent to the side of the fixture body, the distance between the lip and the body being 0.002 to 0.003 inch greater than the thickness of the bracket base.

A sliding V-block *K* beneath the work absorbs the tapping thrust. The V-block has an integral hollow cylindrical stud *L* which is a sliding fit in a hole in the baseplate. Within the stud is a compression spring *M* serving to keep the V-block in an elevated position. On its upper front face, the V-block has an inclined step in which a stop-plate *N* is fixed at an angle corresponding to that of the die-casting.

To lock the V-block, it carries a knurled nut *O* engaging a T-bolt *P*. This bolt is a free fit in a transverse hole through the block, and its head is retained in a vertical T-slot *Q* in the fixture body. When loading the fixture, the nut is released, and the V-block depressed. The lower end of the die-casting is placed in the block, and the upper end raised over the tongue. The block is then permitted to spring upward, and the nut is tightened.

* * *

The American Standards Association's annual report marked last year as the "biggest year for standards" in the history of the organization. The Association approved a total of 238 American Standards from January, 1955, to January, 1956. There are now 388 projects being carried on under the auspices of the Association.



When raised, the V-block (K) absorbs the tapping thrust; when lowered, it permits rapid loading and unloading. Spring (M) keeps block in normally elevated position.

MACHINERY'S PROBLEM CLINIC

Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

Every Specification on a Blueprint Isn't Gospel

The drawing for a precision inspection fixture specified the location of three holes by means of two dimensions and an angle, as shown in the illustration. In making this fixture, a toolmaker used the 1.7500-inch and 6.5625-inch dimensions shown as coordinates in boring holes *a* and *c* relative to hole *b*. As a final check on their locations, the distance between holes *a* and *c* was measured, using plugs placed in the holes. The center distance *ac* was found to be 6.7918 inches, 0.0007 inch more than it should have been according to the following calculation:

$$ac = \frac{1.7500}{\sin 14^\circ\ 56'} = \frac{1.7500}{0.25769} = 6.7911 \text{ inches}$$

Being aware of the accuracy of a precision jig-boring operation, the toolmaker naturally assumed that the value for sin 14°56′ used in the computation was in error. He, therefore, recomputed *ac* using the cosine of 14°56′:

$$ac = \frac{6.5625}{\cos 14^\circ\ 56'} = \frac{6.5625}{0.96623} = 6.7919 \text{ inches}$$

Since this calculated distance was within 0.0001 inch of the measured value, he concluded that the value for sin 14°56′ previously used was given incorrectly in the trigonometric table from which it had been taken. Actually, this was not the case.

Solution:

The root of the trouble is the 14°56′ angle shown on the drawing. This angle should have been shown as 14°55.9′, which is the angle corresponding to a right-angled triangle with sides of 1.7500- and 6.5625-inch lengths:

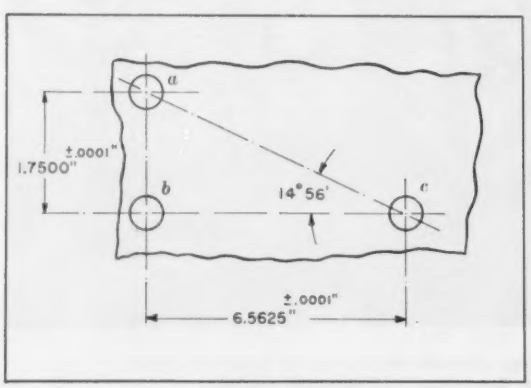
$$\frac{1.7500}{6.5625} = 0.26667 = \tan 14^\circ 55.9', \text{ by interpolation}$$

As a matter of fact, this angle need not have been shown at all, since *ac* could have been determined by the Pythagorean Theorem:

$$ac = \sqrt{(1.7500)^2 + (6.5625)^2} = 6.7918$$

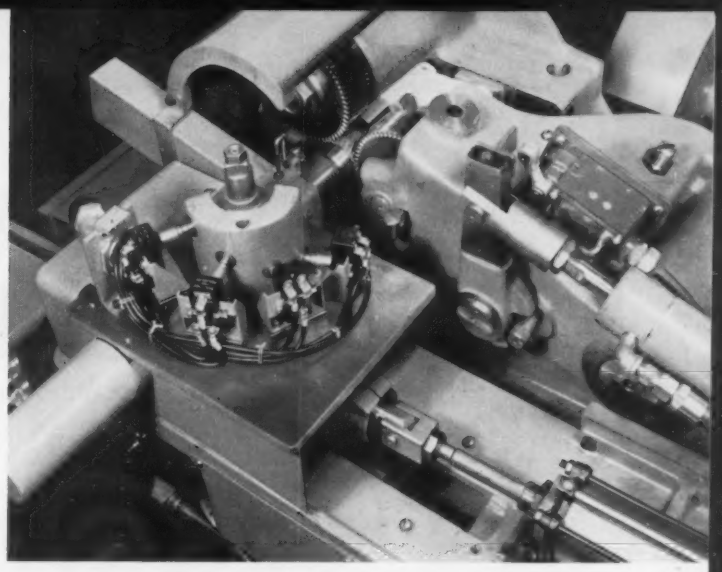
Although the 14°56′ angle shown on the drawing is incorrect, it should be noted that the use of the cosine of this angle in the second computation produced an almost-correct result, whereas use of the sine produced a considerable error. This can be explained, simply, by referring to a trigonometric table and noting that for small angles the cosine of an angle changes at a slower rate than the sine of the angle. For example, the difference between sin 14°55.9′ and sin 14°56′ is 0.00003, while the difference between cos 14°55.9′ and cos 14°56′ is only 0.00001.

The conclusion to be drawn from this observation is that, when calculations involving sine and cosine are to be made, it is preferable to use the cosine function for angles up to 45 degrees and the sine function for angles over 45 degrees.



Locations of holes (a) and (c) relative to hole (b) are sufficiently specified by the coordinate dimensions. The angle shown is unnecessary and, in this case, led to confusion.

Burnishing the Tooth Surfaces of Hardened Pinions



TOOTH surfaces of hardened automotive pinions can be conditioned rapidly on an automatic gear-burnishing machine made by the Fellows Gear Shaper Co., Springfield, Vt. The process requires only a few seconds per piece, but the effect on the pinion tooth surfaces is equivalent to that resulting from several hours running time in service.

As shown in the illustration, the pinion is run in close mesh with three hardened work-gears, the lower left-hand gear being the driver. The right-hand work-gear is mounted at the end of a pivotally mounted arm. An air cylinder raises the arm for loading and unloading the work. A second cylinder actuates a ram that supports an arbor for carrying the work into the operating position. Both air cylinders function automatically by means of cam-operated electrical controls.

As the sequence of automatic operations begins, the ram is drawn back to allow one pinion to roll from the feed chute into the loading position. The ram then moves ahead rapidly, picking up the pinion. As the pinion approaches the work-gear, the ram speed is reduced, the part is moved into mesh with the slowly rotating work-gears, and the previously completed pinion is discharged.

Direction of ram travel is then reversed, and movement of the work-gears is stopped. The gear on the pivot-arm is lowered into position, and the work-gear driving shaft begins to rotate at a high speed. At the end of a pre-set time cycle, slow rotation of the work-gears is resumed, the pivot-arm is raised, and the ram is retracted.

Film Dramatizes Battle Against Corrosion

A 16-millimeter, sound-color motion picture, "Zinc Controls Corrosion," has been produced by the American Zinc Institute, Inc. Available to agricultural, industrial, technical, and educational groups, the film dramatically tells how zinc controls corrosion to lengthen life and to minimize maintenance and replacement costs. It also presents a colorful demonstration of the general mechanism of corrosion.

The thirty-five-minute film shows how zinc controls the corrosion of iron and steel by acting as a barrier and by affording galvanic protection. The viewer is taken through new continuous galvanizing lines and is also shown such means of corrosion prevention with zinc as cathodic protection, metallizing, sherardizing, and painting.

Bookings for the film are being accepted at the American Zinc Institute, Inc., 60 E. 42nd St., New York 17, N. Y. It is available for showing free of charge, and special reservation forms can be obtained on request.

Galvanizing hot-water tanks in a bath of molten zinc. This is a scene from a new film entitled "Zinc Controls Corrosion."

LATEST DEVELOPMENTS IN *Shop*

Acme-Ryder Multiple-Spindle Vertical Chucking Machine

The National Acme Co., Cleveland, Ohio, has announced the addition of a multiple-spindle vertical automatic chucking machine to its line of production equipment. The design of this machine is based on that of the Ryder machine built by Thomas Ryder & Son, Ltd., Bolton, England. Features developed by National Acme have been combined with those of the Ryder design to adapt it to American production practice.

In addition to the eight-spindle model, equipped with 14-inch capacity chucks, eight turning-slides, and four cross-slides as shown in the accompanying illustrations, there will be a six-spindle model having 17-inch capacity chucks, six vertical turning-slides, and four cross-slides. Four additional "auto cross-slides" can be operated simultaneously on the vertical turret of the machine, shown in Fig. 1, to provide greater tooling adaptability for production machining of large forged and cast workpieces.

The cross-slides complement the vertical end-working slides, providing greater flexibility and additional tool positions not previously available in a single set-up on machines of 14- and 17-inch capacities. Because the independent cross-slides are mounted on the lower frame and actuated from cam drums located directly beneath, they provide maximum support for taking the heaviest forming cuts, as well as for cross-facing or necking operations.

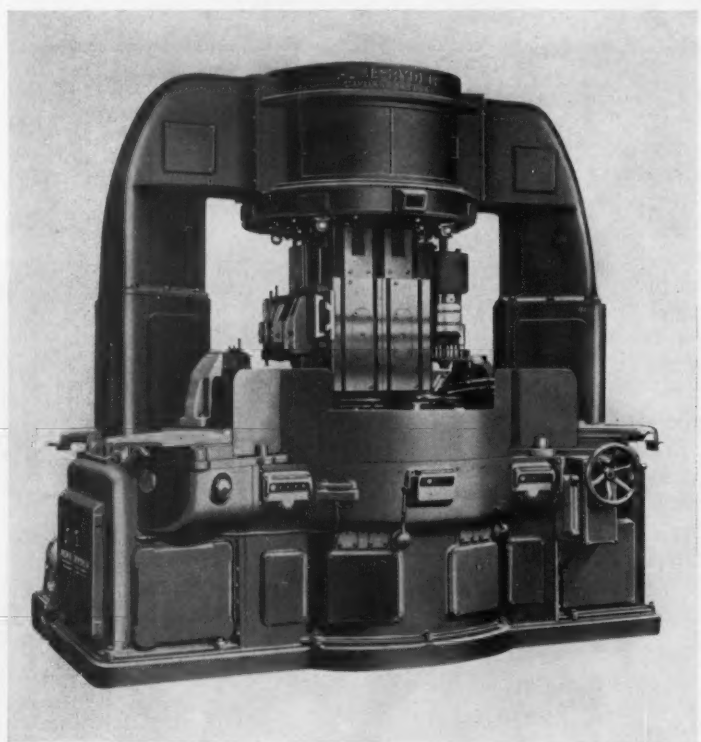


Fig. 1. Acme-Ryder 14-inch eight-spindle vertical hydraulic chucking machine

The machine uses most modern cutting tools and also provides an ample reserve of power to accommodate tools likely to be developed. Standard spindle speeds range from 32 to 628 R.P.M. Three spindle speeds are available at each spindle position and with each set of pick-off gears to provide satisfactory speeds for various cutting requirements.

Positive indexing of the spindle carrier is accomplished by an independent indexing motor with hydraulically operated locking and clamping at the completion of the indexing movement. Change-over from single to double indexing (or vice versa) is accomplished quickly by the removal or addition of a cam on the indexing tappet shaft.

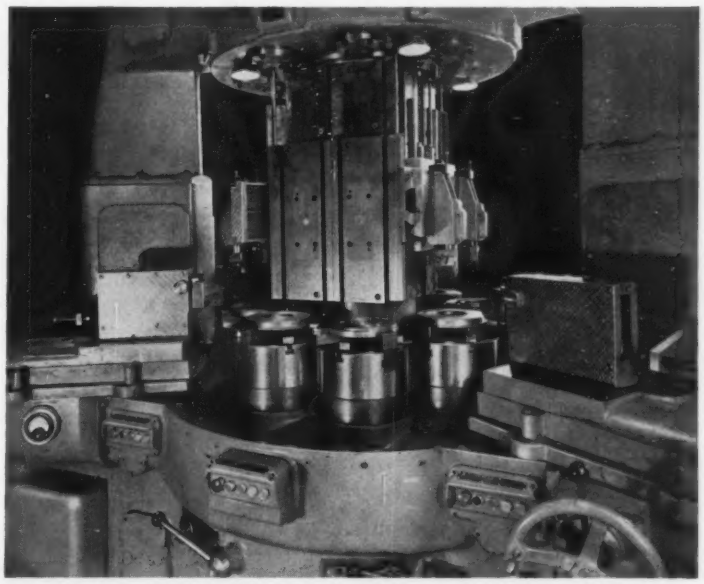
The electro-hydraulic system not only provides a convenient means of actuation and control, but also enables a number of electrical, hydraulic, and mechanical interlocks to be embodied as safety devices to protect both machine and operator. Functions performed hydraulically include: opening and closing of chucks; engaging and disengaging clutches in the spindle drives; applying brakes at the loading stations; providing a reverse motion of the carrier to bring it back against the locating catch after indexing, then actuat-

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

Fig. 2. Double-indexing loading stations for machining both ends of flywheel



ing a wedge to hold the carrier in that position; and clamping the carrier during cutting.

Machine controls are conveniently located near the loading station and are duplicated at the rear position to facilitate setting up. A master timing-cam drum controls the completely automatic machining cycle, operating switches for the entire electrical circuit including the electro-hydraulic circuits.

Frame design employs arch type construction, supported by heavy columns, to insure rigidity and permanent tool-slide alignment. Access panels in the top housing, columns, and base permit easy entry for adjustment and service. The machine, without tooling, weighs about 60,000 pounds.

Circle Item 101 on postcard, page 257

Buildup Wire for Submerged-Arc Process

The Air Reduction Sales Co., New York City, has announced an Airco automatic buildup wire for use with the submerged-arc process. Deposits of this wire are said to be sound, have ample ductility, and form a perfect bond with a surface hard-facing material such as Airco No. 779. The buildup wire responds to heat-treatment and can be applied to all ordinary AISI and SAE steels. It also has high impact strength and good wear resistance.

The wire is designed for use prior to final hard-facing on parts such as tractor rollers and idlers. As a buildup material with no final hard-facing, it is recommended for the restoration of tractor track rails and links, large shafts, and mine car and crane wheels.

Circle Item 102 on postcard, page 257

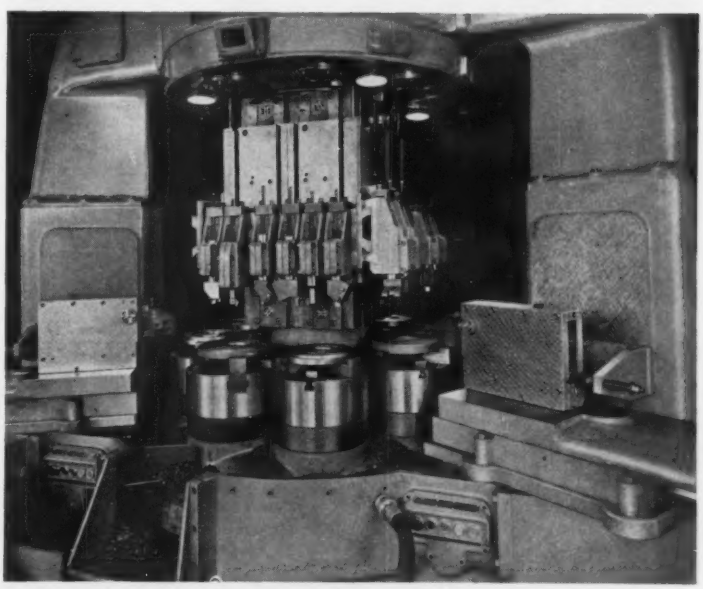


Fig. 3. Rear close-up of tooling on Acme-Ryder automatic chucking machine

Farquhar Press Features Automatic Speed Variations during Cycling

Highly flexible speed variations during the cycling of a triple-action drawing press are provided by a magnetic-hydraulic, servo amplifier control system. The press, Fig. 1, rated at 575 tons and having a 54-inch stroke, has been built by the A. B. Farquhar Division, Oliver Corporation, York, Pa. It will soon be at work in the United States Navy's Portsmouth, N. H., base.

With the new control system, it is possible to adjust the blank-holder and drawing platen speeds from zero to maximum during any portion of the down stroke or up stroke. Metals difficult to form can thus be more readily drawn into unusual shapes, since a speed change may often be desirable as drawing progresses. In the past, it was necessary to use elaborate piping and valve set-ups, as well as rollers and cams, to obtain a major variation in press speed. Such changes were usually a trial-and-error-procedure, were expensive, and had to be made separately for each variation.

Complete control over all press motions is afforded by a panel on which a series of dials is grouped. There are six such dials, or potentiometers, as can be seen in Fig. 2. Thus, six speed changes can be made in a cycle, with each speed independently adjustable from zero to maximum. Dial settings, once made, can be recorded along with die information, then used at a later date to duplicate the drawing operation. This feature reduces subsequent set-up time and expense.

In a typical semi-automatic cycle, speeds might be as follows: With blank-holder and drawing platen in up position, a part blank is loaded and cycle start buttons are depressed. The blank-holder and drawing platen execute a fast approach until contact is made with an adjustable limit switch. Blank-holder contacts part blank and builds up clamping pressure to desired tonnage, while drawing platen continues down at pressing speed. At end of stroke, the drawing platen is reversed by a position or pressure switch and starts up slowly until punch is stripped from work-piece. Drawing platen then speeds upward, slows down to pick up blank-holder without shock, and reaches maximum speed for balance of up stroke.

A smooth press reversal is assured in less than three-quarters of a second, even at maximum speed. Harsh surges in oil lines are eliminated, and the possibility of developing leaks at joints is kept to a minimum.

The various gages seen on the operating panel of the press, Fig. 3, indicate oil temperature and pressures of the three sliding members of the triple-action press. Pressures at each corner of the blank-holder are individually adjustable by the four small star-wheels seen under their respective gages. In this way, wrinkling at one point of the work-piece can be quickly corrected. In the past, it was necessary to shim up the die at the trouble point.

The pump for the hydraulic system is a standard Oilgear DY variable-delivery, radial rolling piston unit equipped with a new form of servo control. Variable delivery is obtained by moving the pump slide-block to one side or the other of neutral by means of the servo control. This control, furnished by the Raytheon Mfg. Co., consists of a magnetic amplifier, an electric servo motor and follow-up potentiometer, a two-stage hydraulic amplifier, and a command position potentiometer and pre-set unit.

In operation, the magnetic amplifier compares the command signal from either the position potentiometer or one of the pre-set potentiometers with the poten-

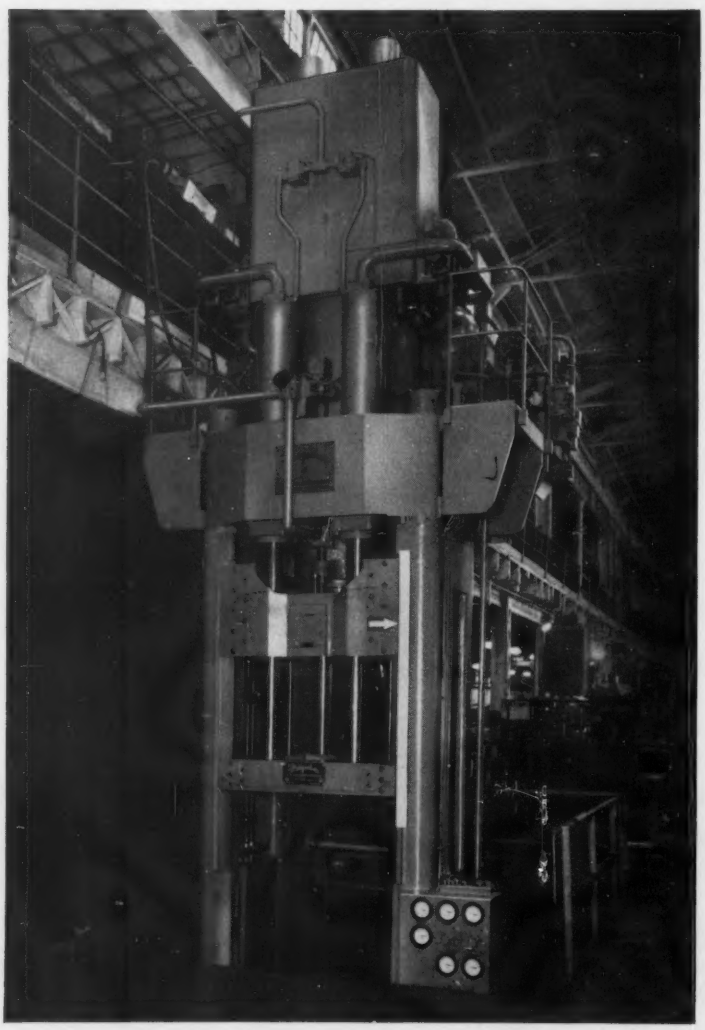


Fig. 1. Farquhar hydraulic press with servo-motor speed variation control

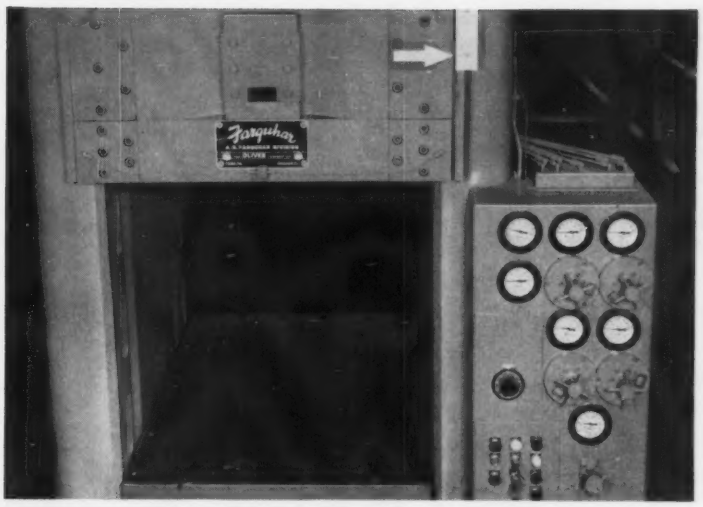


Fig. 2. (Left) Six potentiometers allow speed changes from zero to maximum for various portions of the press cycle. Fig. 3. (Right) Star-wheels on control panel permit independent pressure adjustment at blank-holder corners

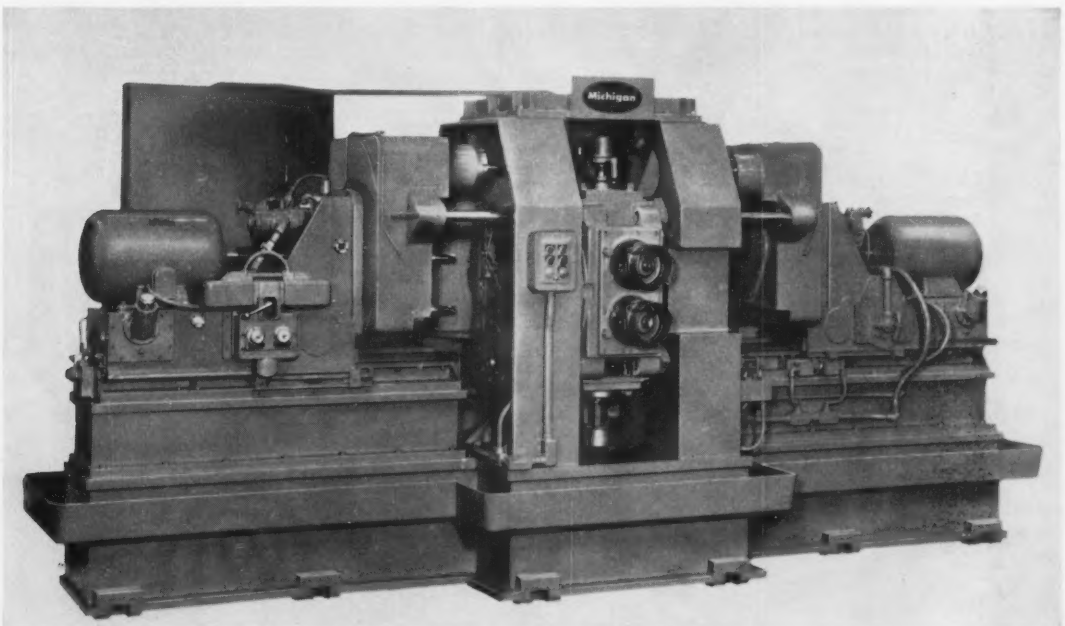
tiometer which measures the drawing platen or pump slide-block position. Any existing difference is amplified and causes the electric servo motor to rotate. The output of the servo motor is then multiplied through two stages of hydraulic amplification and used to shift the slide-block until the desired correlation of command to output signal is obtained.

Circle Item 103 on postcard, page 257

Michigan Double-End Trunnion Type Machine

The Michigan Drill Head Co., Detroit, Mich., has brought out a special double-end, four-station, trunnion type machine, designed for high-speed production processing of compressor housings. This machine was built to rough-bore and semifinish-bore compressor housings for air-conditioning and refrigeration components.

Mounted on each of two standard HC-10 units are the four-spindle, heavy-duty boring heads. The way type feed units are self-contained. Parts are power clamped and the drill head automatic index table is hydraulically operated. The machine is built to



Special machine built by the Michigan Drill Head Co. for high-speed production of compressor housings

J.I.C. electrical and hydraulic standards, and has automatic lubrication throughout.

Using carbide tools and a feeding rate of 11 inches per minute, this machine will handle 420 housings per hour. Two housings are processed at each station of the machine to maintain this production rate.

Circle Item 104 on postcard, page 257

Connecticut Press Brake

A Model 24-A-412 Connecticut press brake with a rated capacity of 24 tons has just been announced by W. Whitney Stueck, Inc., Old Saybrook, Conn. This machine has all-steel gearing, front-operated variable-speed drive, 1-H.P. motor, and front-operated back-gage. It will bend 4 feet of 12-gage mild steel over a 7/8-inch die.

The bed and ram are 48 inches long; the distance between side frames is 32 inches; and the stroke, 2 inches. Adjustment of the ram by means of enclosed, worm-geared pitmans is 1 1/2 inches. Die space over the bed is 7 1/2 inches with stroke down and adjustment up, and the gap is 6 inches deep.

Circle Item 105 on postcard, page 257

Improved Red Ring Gear-Shaving Machine

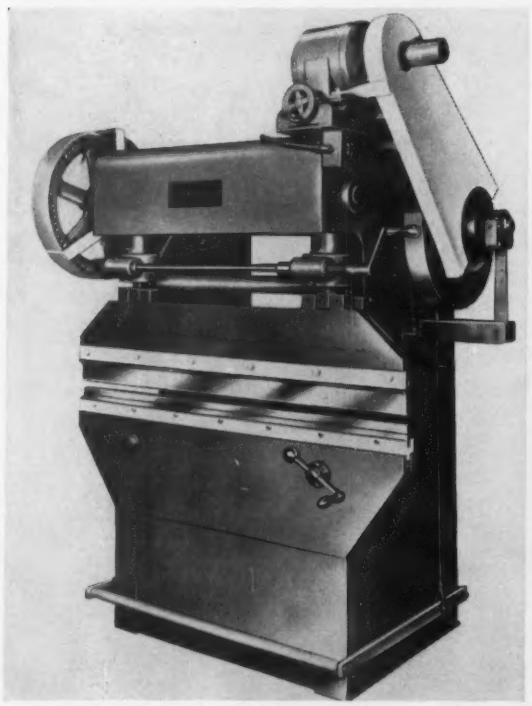
An improved Model GCP-24-inch Red Ring gear-shaving machine for finishing external and internal spur and helical gears having pitch diameters up to 24 inches is announced by the National Broach & Machine Co., Detroit, Mich. This compact, space-saving machine is equipped with loading rails that enable external gears to be easily loaded under the shaving cutter which is removed as soon as the operation has been completed.

When internal gears are shaved, a swivel work-head and internal cutter-head attachments are used. A hollow spindle in the work-head permits shaving parts with integral shafts. The swivel work-head enables the work to be swung out toward the operator for easy loading and unloading. The cutter on the internal cutter-head is brought into mesh with the work-gear and locked in one motion. The work-gear drives the cutter when shaving internal gears. When set up to shave external gears, the cutter drives the work on the machine.

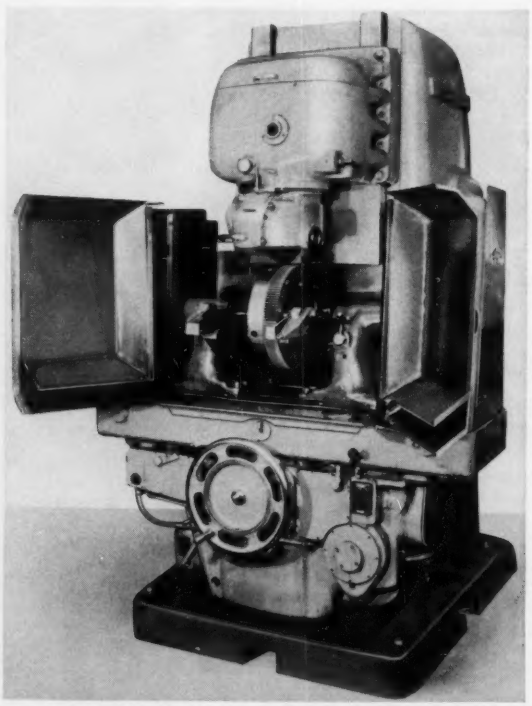
The machine will shave external gears within a pitch diameter range of from 3 to 24 inches in the 2 to 16 diametral pitch range. Internal gears with pitch diameters from 6 to 24 inches in the same tooth size range can be shaved on the machine. Crown shaving of the gear teeth is accomplished by the Red Ring rocking table action.

Slide mounting of the cutter-head maintains gear working heights over a wide range of gear sizes. Automatic infeed of the work at the end of the stroke, as it passes back and forth across the shaving cutter, is accomplished by a separate motor drive. Cutter spindle rotation and table reciprocation are also accomplished with separate motor drives. A cutter reversal timer is provided in the cutter drive for external gears to avoid inertia load effects when large, heavy gears are being shaved. The machine handles gears up to 28 7/8 inches between centers. A 10-inch maximum table stroke can be used for straight shaving. A stroke of 6 inches is possible with crown-shaving operations. The machine occupies a floor space 63 by 67 inches; is 100 inches high; and weighs 12,200 pounds.

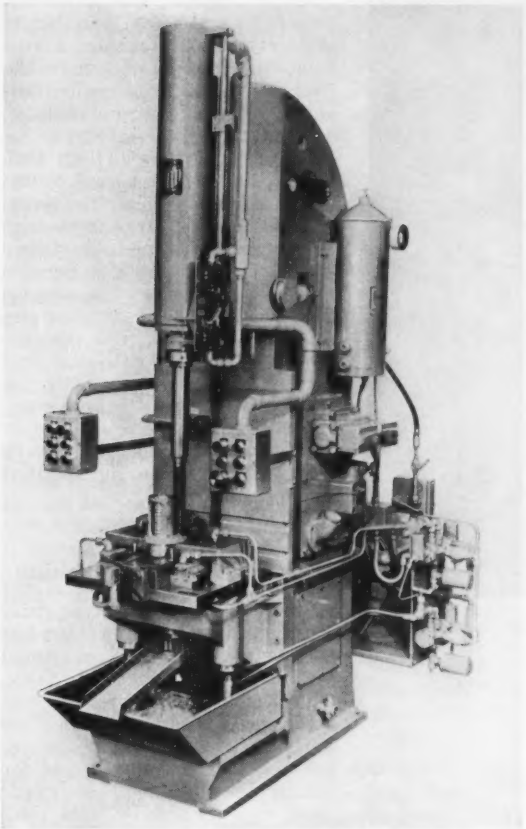
Circle Item 106 on postcard, page 257



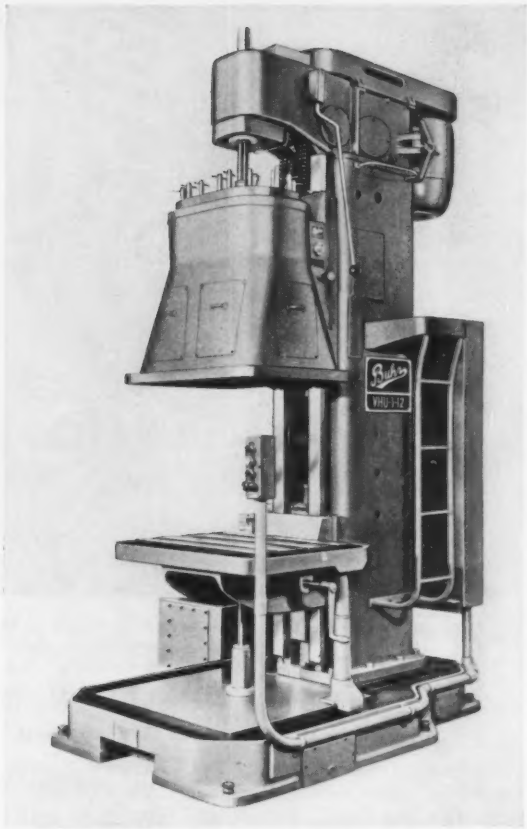
Press brake announced by W. Whitney Stueck, Inc.



Red Ring gear-shaving machine of improved design



American hydraulically operated horning type broaching press



Buhr Model VHU-12 vertical multiple-spindle drilling machine

Horning Type Broaching Press

A hydraulic, horning type press, designed for continuous automatic cycle operation, has been announced by the American Broach & Machine Co., Ann Arbor, Mich. This machine is equipped to broach thirty external involute gear teeth on a bronze automotive synchronizer ring. The broaches are mounted in a stationary pot type holder through which the part is pushed. Ten high-speed steel involute-spline broach rings are mounted in the pot, which also acts as a guide for the push-bar.

An air-operated automatic slide, interlocked to the machine cycle, carries the parts from the tube feed to the broaching position over the broach pot. The parts are automatically stripped and ejected below the pot, and are fed to the slide by a gravity tube feed. A single spline inside the tube serves to locate the notched parts.

With the machine running on continuous automatic cycle, the operator only has to keep the magazine filled with parts. Parts are placed in the tube feed indexed by the spline. The slide picks up a part from the tube and moves it into the broaching position. The ram then moves the push-bar down, pushing the part through the broach pot, broaching thirty involute gear teeth. At the end of the broaching stroke, the stripper fingers move in between the part and broach pot, stripping the part from the push-bar which is returned by the ram. A plunger then moves out, ejecting the part down the discharge chute. Production is about 300 parts per hour.

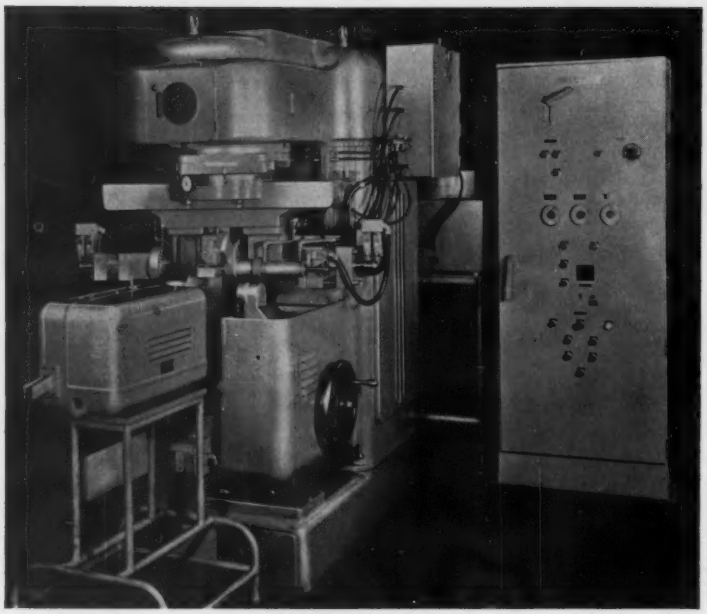
Circle Item 107 on postcard, page 257

Vertical Multiple-Spindle Drilling Machine

The Buhr Machine Tool Co., Ann Arbor, Mich., is building a new line of standard vertical drilling machines with hydraulic feed and universal-joint drive spindles. Construction to J.I.C. electrical and hydraulic standards provides for full use of the spindle-drive motor power, while a separate motor is employed to drive the hydraulic power unit. Other features include hardened and ground steel ways and automatic lubrication of all moving parts.

The three basic models of this new line, available in various way widths, strokes, and maximum horsepowers, are: VHU-12 with 12-inch-wide ways, 7 1/2-H.P. motor; VHU-18, with 18-inch-wide ways, 18-inch stroke, and 15-H.P. motor; and VHU-24-inch ways, 24-inch stroke, and 20-H.P. motor. Each basic model is built in a wide variety of head sizes and spindle-drive arrangements. A wide range of spindle speeds is available through a speed-selector and pick-off gears in the main gear-box. In addition, each spindle drive is equipped with an independent high- and low-speed change mechanism. Infinite feed range and various cycling sequences are attained by hydraulic feed.

Circle Item 108 on postcard, page 257



Michigan underpass gear-shaving machine "Gear-O-Mation" equipped for finishing automotive pinions

Underpass Gear-Shaving Machine Designed for Automation

A "Gear-O-Mation" equipped underpass gear-shaving machine, designed to finish automotive gears automatically at the rate of 260 per hour, has been built by the Michigan Tool Co., Detroit, Mich. This entire production unit consists of an underpass gear-shaver with vibrating hopper feed, automatic loading device, a three-way probe type gear classifier, and a control panel. In addition to controlling the operation of the machine, the control panel counts correct size gears and keeps track of over- or under-size gears on both a percentage of production and a total count basis. A feed-back system actuated by the gear classifier through the control panel automatically corrects center distance when under- or over-size gears come through. If this condition persists, the machine is shut down automatically for corrections.

Stock to a depth of 0.004 to 0.006 inch is removed in the shaving operation performed by the machine illustrated. The 18-tooth, 15 1/2 normal pitch gear has a left-hand helix angle of 22 degrees 11 minutes 30 seconds, face width of 1 1/8 inches, and outside diameter of 1.1419 inches. The bore diameter is 0.6876 to 0.6881 inch.

Outside diameter on the stub arbors is held within 0.6873 to 0.6875 inch, which gives a light press fit between gear bore and stub arbors when the gear is being shaved. The pneumatic cylinder which operates the headstock center has a diameter of 6 inches, while the tailstock cylinder has a diameter of 4 inches. When the gear is loaded, the headstock center, powered by the larger cylinder, bottoms against a stop when its stub arbor enters the bore of the gear. The smaller tailstock cylinder does not bottom, but exerts full pressure on the headstock stub arbor. Both stub arbors are instantaneously withdrawn after the gear is shaved.

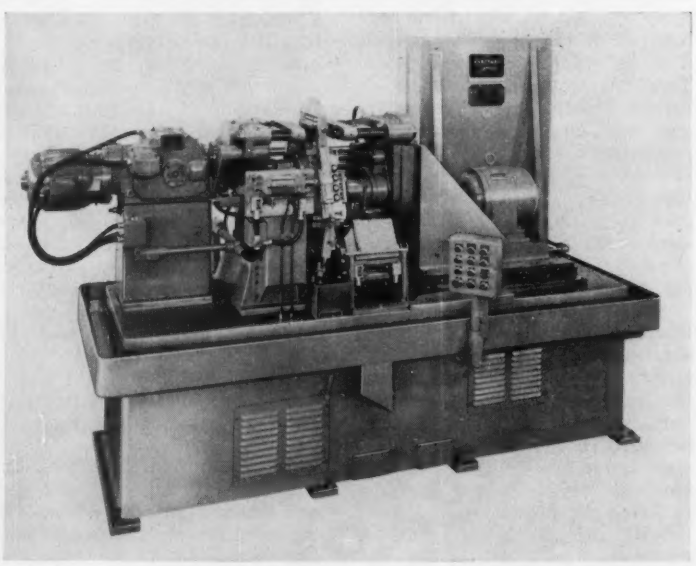
After the gears are shaved, they pass through a chute to the three-way gear selector which permits gears of the correct size to pass through. Any under- or over-size gears are diverted, with the control panel counting each one. This quality control set-up with the feed-back system checks every shaved gear for size and gives maximum assurance that every gear will be within the specified size tolerances.

Circle Item 109 on postcard, page 257

Hartford Special Machine

A vertical, indexing type drilling and chamfering machine has been built by the Hartford Special Machinery Co., Hartford, Conn. This machine employs regular cam feed and barrel type cam feed units. It is shown in the accompanying illustration equipped for quadruple loading, automatic clamping, unclamping, and ejection of the work. When operated at 100 per cent efficiency, the machine drills the pin-hole of steering knuckles at the rate of 1600 parts per hour.

Circle Item 110 on postcard, page 257



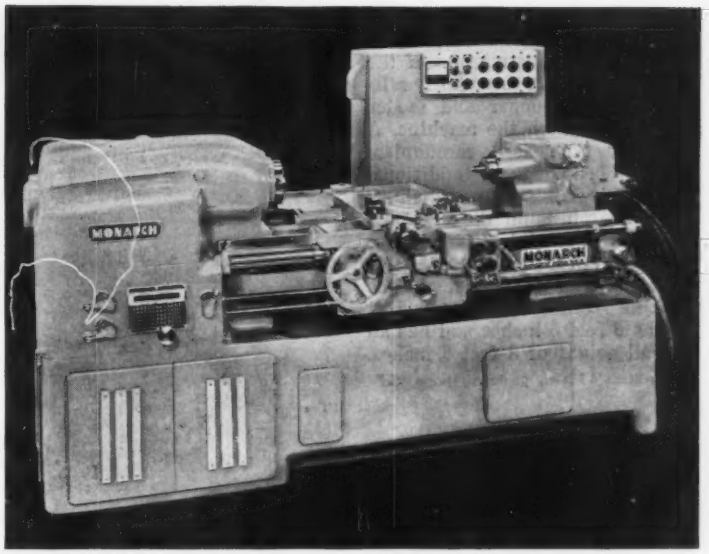
Drilling machine built by Hartford Special Machinery Co.

Electrical Preselector for Monarch Precision Lathe

An electrical preselector control for the Series EE Model 1000 precision turning lathe manufactured by the Monarch Machine Tool Co., Sidney, Ohio, provides automatic changing of motor speed and gear selection for up to five different cutting conditions. This equipment is designed to reduce machining time and operator effort on any work-run involving two or more duplicate pieces. It functions in conjunction with the lathe's regular all-electric motor-speed control and hydraulic gear-shifting mechanisms.

The preselector control enables the operator to pre-set the exact motor speeds and gear changes to be used for the various cuts on the work-pieces and, during operation, to obtain these speeds and gear changes automatically by simply indexing an apron-mounted selector switch from one position to the next. Indexing of the selector switch causes the machine's main drive motor to slow down to the proper shift speed, the headstock gears to shift hydraulically to the desired range, and the drive motor to accelerate to the exact speed pre-set for the particular cut.

The motor-speed and gear-range controls for one cutting condition are mounted on the apron of the lathe, with controls for the second through fifth cutting conditions grouped on a separate control panel that projects over the tailstock of the machine. All controls are within easy reach of the operator from his normal position at the apron. The main drive motor is a 20-H.P. variable-speed unit that receives its power from a 6-phase type of controlled rectifier system.



Monarch precision turning lathe equipped with new electrical preselector control

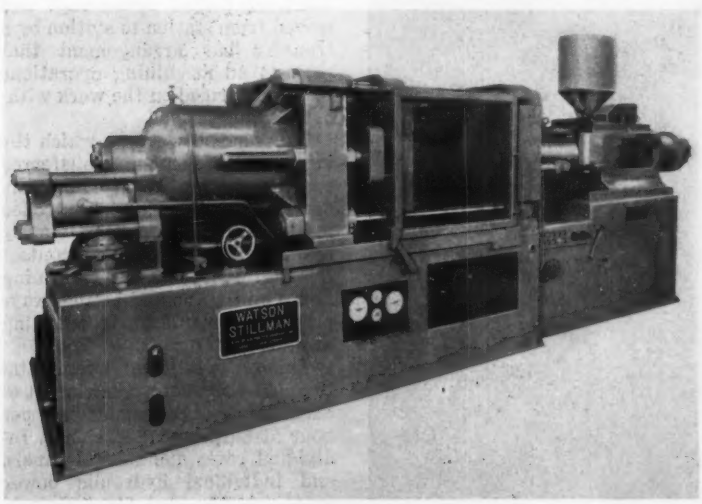
Circle Item 111 on postcard, page 257

Watson-Stillman Injection Molding Machine

A horizontal plastics injection molding machine, designed for faster cycles and high plasticizing rates in the production of molded parts weighing up to 24 ounces, has been introduced by the Watson-Stillman Press Division, Farrel-Birmingham Co., Inc., Roselle, N. J. A straight hydraulic mold clamp with an adjustable clamping stroke is incorporated in this machine. The heating cylinder features an internally heated torpedo with four-zone heat-control developed to obtain better plasticizing at lower temperatures. The injection plunger is positioned so that the mold is filled immediately after the dies are clamped. Provision is made for stepless adjustment of both the pressure and speed of the injection stroke. A stuffing arrangement serves to increase the maximum shot capacity by approximately 40 per cent.

The Oilgear pumping system consists of a radial piston type pump connected to a 60-H.P. motor having a speed of 1200 R.P.M. The pump control maintains the pre-set pressure continuously with automatic follow-up without excessive heating or power loss. A new prefill system with a shock piston for decompression relieves shock at the prefill valve.

The machine is designed for the future installation of a Watson-Stillman preplasticizing unit which will increase the capacity to 90 ounces. A floor-mounted electrical



Injection molding machine introduced by the Watson-Stillman Press Division, Farrel-Birmingham Co., Inc.

control panel, furnished with the 24-ounce machine, has ample provisions for the installation of the preplasticizer. A standard self-compensating hopper and feeder are supplied with the machine. A weighing type feed mechanism can be provided as additional equipment. Ram spacers which reduce the minimum die-thickness requirements, and low-pressure die-closing for additional mold protection can be furnished. The machine requires a floor space 21 feet by 6 feet 6 inches and has an over-all height of 8 feet 6 inches.

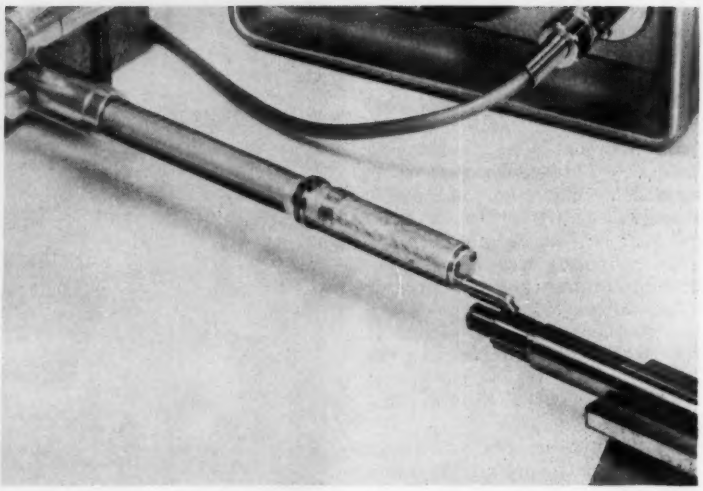
Circle Item 112 on postcard, page 257

Versatile Tracer for Profilometer

The Micrometrical Mfg. Co., Ann Arbor, Mich., has announced a Profilometer Type LJ tracer for measuring surface roughness. This tracer is said to be capable of measuring the surface roughness of more than 85 per cent of the varied surfaces produced by the metal-working industry. It can be operated by "Mototrace" or by hand and can be used with any Profilometer "Amplimeter" and "Mototrace."

The versatility of the tracer is made possible by having its contact point located at the end of a projecting beam and by providing three interchangeable "Skidmounts" that support the tracer.

The Type FP "Skidmount" has a small-diameter nose, with a single skid directly back of the tracer point, and is used with a "Mototrace" for mechanical tracing. It will measure the roughness of internal cylindrical surfaces in holes as small as 1/4 inch in diameter and of cylinders as small as 1/8 inch in diameter, as well as the surfaces of flats and tapers.



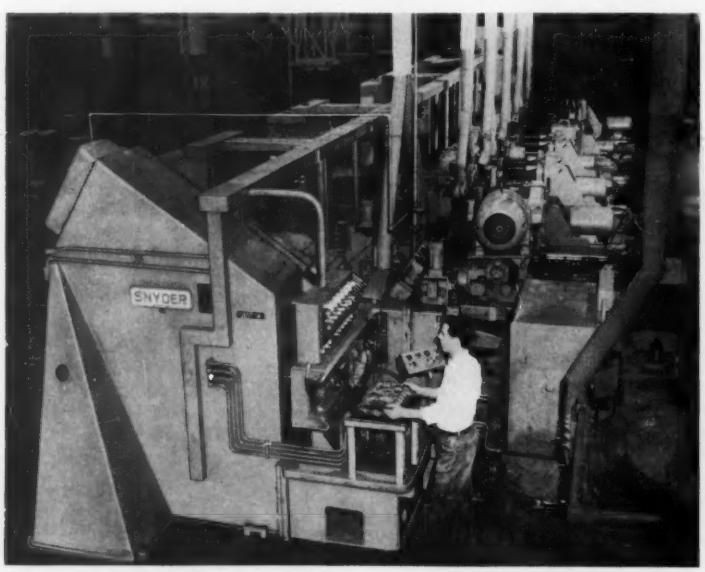
Tracer for Profilometer announced by the Micrometrical Mfg. Co.

The Types FL and FM "Skidmounts" have two skids—one at each side of the tracer point—and are used for manual operation, with the tracer held by a plastic clip or attached to a "Stiffarm." They may also be used on gear teeth as small as 10 diametral pitch.

Circle Item 113 on postcard, page 257

Snyder Transfer Machine for Processing Manifolds

A compact segmented transfer machine with a unique vertical rail arrangement for transporting the work and horizontal way units for performing all the milling, drilling, and tapping operations on automotive engine intake manifolds has been built by the Snyder Tool & Engineering Co., Detroit, Mich. The intake manifolds are turned up on edge and moved from station to station by a transfer bar arrangement that permits all machining operations to be performed on the work without turning it over.



Snyder segmented transfer machine for processing automotive engine intake manifolds

The vertical ways on which the intake manifolds are transferred run the length of the hydraulically operated, electrically controlled machine. Flat surfaces previously milled on the manifolds contact the rail surfaces, and retaining strips on the top and bottom ways prevent the manifolds from falling away from the rails.

This seven-segment, twenty-station, 54-foot long machine produces sixty-eight manifolds per hour at 80 per cent efficiency. Individual bases and control panels, and individual hydraulic power units are provided for each segment.

Circle Item 114 on postcard, page 257

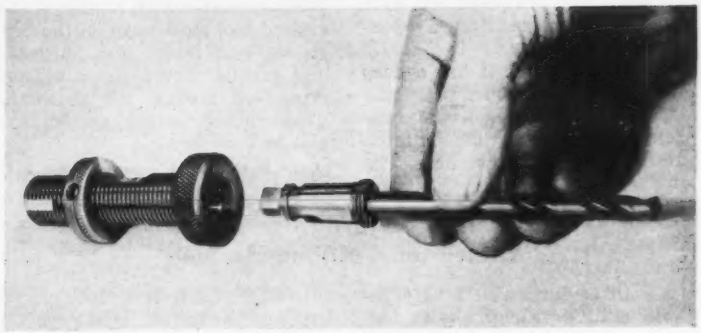
Lock-and-Eject Adapters for Drills and Taps

Scully-Jones & Co., Chicago, Ill., have announced a new line of lock-and-eject adjustable adapters for multiple-spindle machines used for drilling, tapping, and similar work. Set-up time is said to be reduced by as much as 30 per cent.

In order to change tools, the operator merely turns the threaded nut to unseat the chuck which grips the tool, inserts the new tool, and turns the nut to its locking position. No pounding or excessive torsion is required to lock the tool in place. The threaded nut is fitted with spanner wrench holes on its outer knurled surface, as well as on its face, to facilitate tool changing.

Another new product is a four-slot lock-and-eject chuck which furnishes four-way gripping action with a true collet effect. This chuck is designed to hold the cutting tool securely in place and to reduce damage due to pull-out, especially when deep-hole drilling crankshafts. With this equipment, cutting tools are said to run true within 0.002 inch. A wide range of tool sizes may be accommodated.

Circle Item 115 on postcard, page 257



Scully-Jones lock-and-eject adjustable adapter

Centering Reel for Press

Sesco Inc., Detroit, Mich., has brought out a centering reel designed for angular feeding of coil stock. The entire reel is mounted on rails that permit lateral adjustment by simply rotating a crank at the rear of the reel. The crank can be operated by hand or motorized to suit the user's preference. Lateral adjustments can be made to obtain perfect alignment of the coil stock with the die.

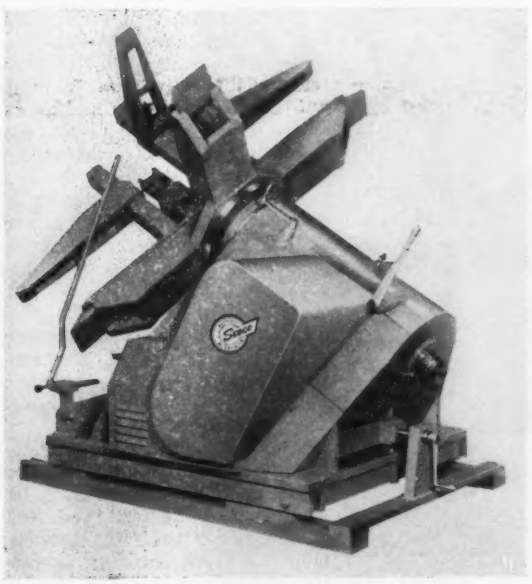
The four expander arms of the reel are operated in unison by positive power and will accommodate coils having varied inside diameters ranging from 15 to 28 inches without resorting to adapters. The expander arms are designed to assure trouble-free and easy loading.

Uncoiling of the stock is started by merely pressing a button. The high torque variable-speed drive is reversible and has automatic braking to assure rapid starting and stopping. The reel can be operated in either a clockwise or counterclockwise direction.

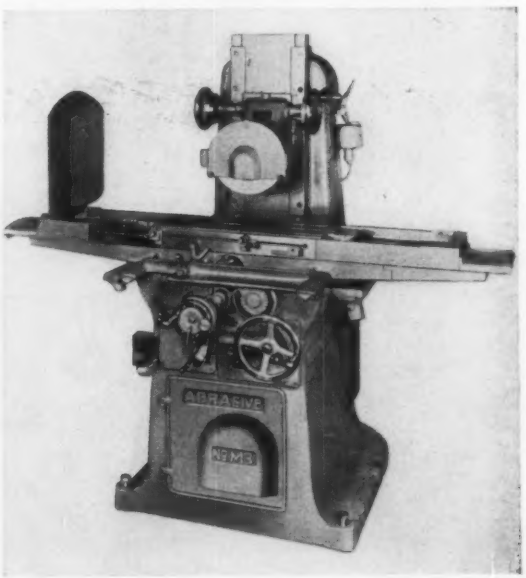
Circle Item 116 on postcard, page 257

Precision Surface Grinder

The Abrasive Machine Tool Co., East Providence, R. I., has introduced a No. M3 precision surface grinder with built-in 2-H.P. motorized spindle having many of the design features incorporated in the company's regular machines. With the direct motorized spindle, it is possible to grind with precision accuracy at table travel speeds of from 20 to 60 feet per minute. The direct spindle drive (completely removable) is the chief difference between the No. M3 precision grinder and the Abrasive No. 3B. It has the same easily serviced one-piece construc-



Sesco centering reel for feeding coil stock



Surface grinder made by Abrasive Machine Tool Co.

tion and rigid, one-piece bed with heavy ribs and reinforced openings.

Like the No. 3B, it has a deep box-like saddle, a ribbed table, and a 24- by 8- by 12-inch work capacity. It has fully automatic feeds and built-in shock absorbers. The M3 is available with hardened and ground tool steel ways on the bed, saddle, and table; and hardened and ground thread elevating and cross-feed screws. An automatic pressure lubricating system can also be furnished.

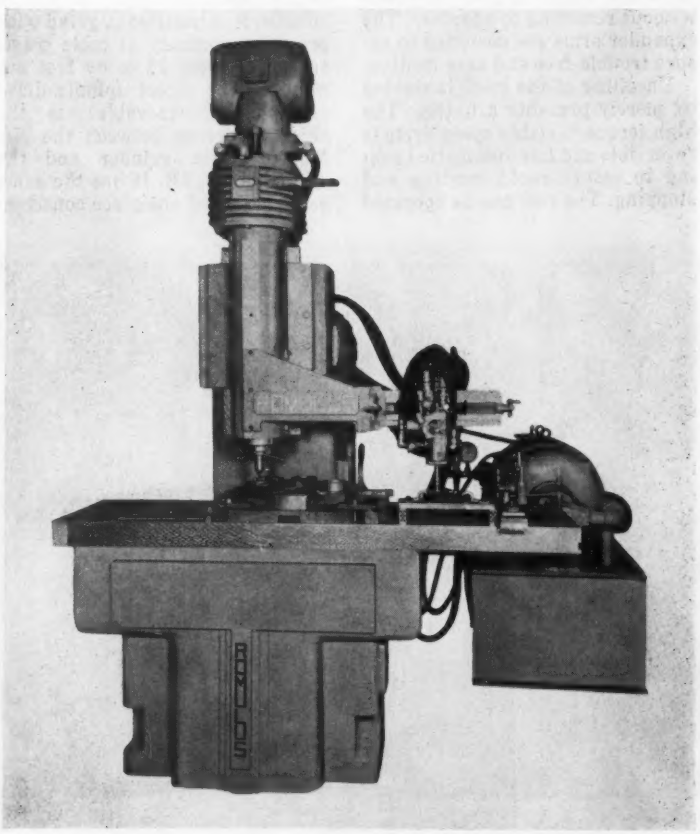
Circle Item 117 on postcard, page 257

Romulus Hydro-Cycle Three-Dimensional Milling Machine

A three-dimensional Hydro-Cycle milling machine that features an all-hydraulic spindle with stepless speed control, especially adapted for use in die and pattern shops, has been announced by Romulus Tool & Engineering, Romulus, Mich. This machine will mill left or right, forward or back, and up or down. It will cut circles to tolerances of 0.002 inch. Closer tolerances are readily held in the finishing of deep cavities and pockets.

Vertical, cross, and longitudinal movements are synchronized and controlled through a pencil type stylus arm. All movements are manually controlled by merely guiding the stylus arm over the surface of the die or part which is to be duplicated. The machine is especially well suited for milling aircraft structural members of aluminum or the tougher metals. Milling heads (such as used on this machine) can be employed to convert an older mill, or for attachment to a special machine. The hydraulic spindle has a speed range of from 200 to 2500 R.P.M. with infinite speed selection. Standard heads are available up to 50 H.P. Heads over 50 H.P. are built to special order.

Circle Item 118 on postcard, page 257



Milling machine introduced by Romulus Tool & Engineering

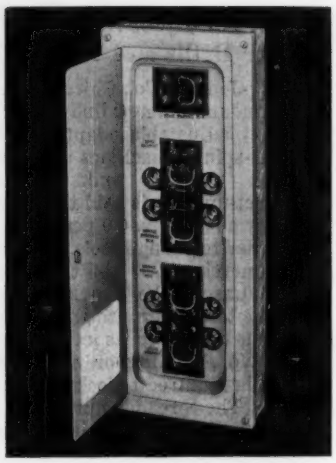


Fig. 1. G-E fusible service entrance panel with five parallel-connected fuse pullers

General Electric Service Panels

Introduction of two new 100-ampere fusible service entrance panels has been announced by the General Electric's Trumbull Components Department, Plainville, Conn. The unit shown in Fig. 1 has five fuse pullers and eight plug fuse branch circuits. It is designed to provide adequate wiring in the modern electrified home and supply adequate circuits for several 240-volt appliances such as range, clothes dryer, water heater, and air conditioner, as well as 120-volt lighting and appliance loads.

Features that simplify installation of the new panel include straight-in wiring at line and load terminals to eliminate fumbling with looped wire ends and an exclusive slide-out interior that can be easily removed to provide extra hand-room for mounting the box, pulling in wires, and fastening securely without screws. Silver-plated copper current-carrying parts insure cool operation, and both box and front are Bonderite-coated to resist corrosion. The device is available in a general purpose enclosure with fronts designed for surface or flush mounting. Complete wiring instructions are packed inside each unit.

The fusible service entrance panel, shown in Fig. 2, similar to the one illustrated in Fig. 1, has 100-ampere main lugs, four fuse pullers, and either eight or twelve plug fuse branch circuits. It is designed to supply adequate circuits and wiring protection for modern

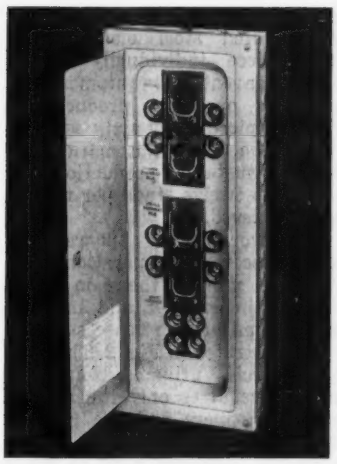


Fig. 2. Electric service entrance panel with four parallel-connected fuse pullers

homes and has connections for both 240-volt appliance loads and 120-volt lighting circuits.

Circle Item 119 on postcard, page 257

"Speedy Driller" for Sheet-Metal Parts

A high-speed, semi-automatic drilling machine, designed for the aircraft and automotive industries, has been announced by the Fairchild Aircraft Division of the Fairchild Engine & Airplane Corporation, Hagerstown, Md. This portable, 365-pound "Speedy Driller" is built by Fairchild's Speed Control Division, St. Augustine, Fla. It has been used successfully at the Hagerstown plant for drilling flanged sheet-metal aircraft parts.

The machine automatically locates and drills holes under the control of projecting teeth on a template clamped to the work. The work and the template, which is cut to extend 1/4-inch beyond the edge of the material to be drilled, are fed into the machine as shown in the illustration. When a template tooth engages a trigger mechanism, the machine automatically drills a hole. The instant the drill is fully retracted, the trigger assembly releases the template and the work, allowing them to be moved forward for a repetition of the cycle.

Up to three holes per second can be drilled in aluminum material 0.064-inch thick, holding locations to close tolerances. Operating speed depends on the diameter, spacing, depth of hole, and material drilled.

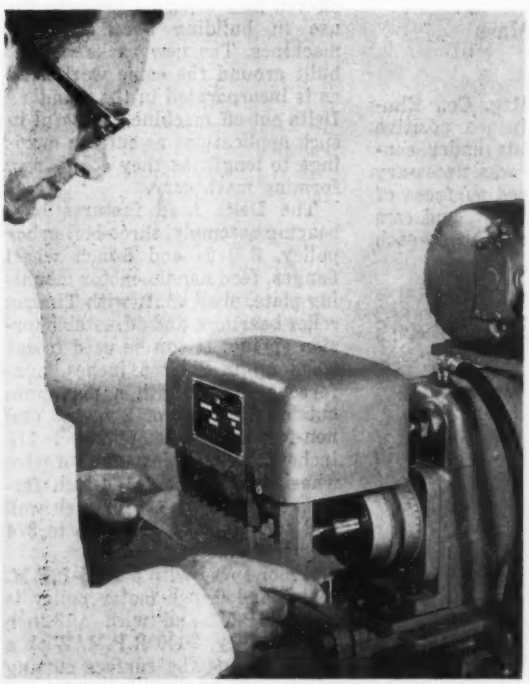
Circle Item 120 on postcard, page 257

Baldwin Creep Testing Machine

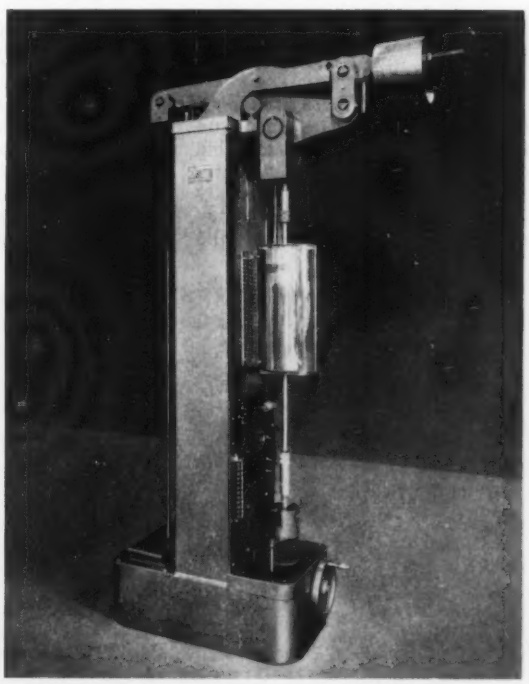
Four basic types of tests can be performed on a new creep testing machine of 20,000-pound capacity developed by the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. With different sub-assemblies, this machine can be used for long-time creep tests, the load being applied and measured by weights on a lever arm. It can be employed for creep-rupture tests, with motor-driven screw loading controlled by a Microformer load transducer and null-balance controller with a 1000-division indicator dial. The same basic machine with different components can also be used for constant strain-rate and relaxation tests.

A new feature of the lever-arm loading system is a motor-driven loading screw used to maintain the lever in a horizontal position during creep of the test specimen. Weights are lifted only a fraction of an inch so that fracture of the specimen will produce minimum shock. A 40 to 1 ratio lever system permits loading to rated capacity with a weight load of 500 pounds.

An improved furnace provides for tests up to 1800 degrees F.



Fairchild "Speedy Driller" with locating template for accurate hole-spacing



Creep testing machine developed by the Baldwin-Lima-Hamilton Corporation

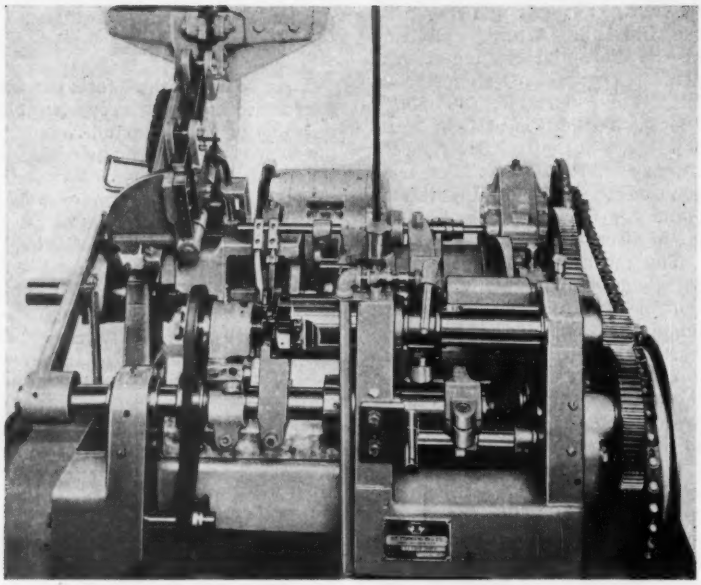


Fig. 1. Specially equipped Townsend automatic adapted to rapid production of cam stud fasteners for aircraft covers

This furnace is tubular, 16 inches long, and has a thermo-couple for heat measurement and control. Creep measurements can be made inside the furnace by means of an optional extensometer, with a range of 2 inches, attached to the specimen. Movement of the loading screw measures specimen elongation when the extensometer is not used. Elongation is indicated by a counter in increments of 0.000025 inch.

Circle Item 121 on postcard, page 257

Townsend Automatics Equipped for Mass Production of Precision Studs

The problem of mass producing a precision locking cam stud fastener for hinged or removable covers on aircraft was recently solved by using four specially equipped automatic secondary operation machines built by the H. P. Townsend Mfg. Co., Elmwood, Conn. To insure positive locking of the studs under constant vibration, it was necessary to keep the machined surfaces of the cam form, end slot, and cam release in precise relation to each other. Specifications called for heat-treated steel blanks, with each piece individually milled. Using conventional equipment, the average operator produced a finished piece every sixty seconds. With the four automatics, an average sustained production rate of ten to twelve studs per minute was achieved.

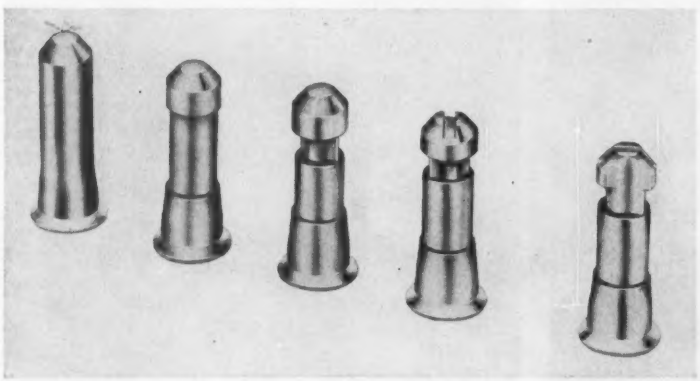


Fig. 2. Views illustrating operations performed by four Townsend automatics in machining precision stud shown completed in view at extreme right

The work, as it appears after each successive operation—side turning, milling the cam form, milling the end slot, and finishing the end mill cam release surfaces—is illustrated in Fig. 2. The complete cycle, utilizing four machines, requires only the loading of the hoppers and the replacement of cutting tools by the operator, who can tend as many as eight machines at one time. A high-speed cutter is used, and the cutting tool is replaced on each machine every thirty minutes. A standard cutting oil is used as the coolant.

Circle Item 122 on postcard, page 257

Delta Cut-Off Unit

The work-head and belt-guard assembly of the Delta cut-off machine made by the Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa., are now being offered as a separate package for use in building special-purpose machines. The new package unit, built around the same work-head as is incorporated in the standard Delta cut-off machine, is useful in such applications as cutting moldings to length as they come from forming machinery.

The Delta head features ball-bearing assembly, three-belt arbor pulley, 3 1/2- and 5-inch wheel flanges, feed handle, motor mounting plate, pivot shaft with Timken roller bearings, and adjustable torsion spring. It can be used to cut wood up to 2 by 6 inches, non-ferrous tubing with a maximum outside diameter of 2 inches and non-ferrous solids up to 1 1/2 inches thick. Using an abrasive wheel, it will cut 1 1/4-inch ferrous tubing with a 5/32-inch wall and ferrous solid stock up to 3/4 inch in diameter.

Arbor speed with a 1725-R.P.M. motor and 6-inch motor pulley is 4000 R.P.M. and with a 3-inch motor pulley, 2000 R.P.M. With a 10-inch blade the surface cutting speeds are 10,500 and 5250 feet per minute.

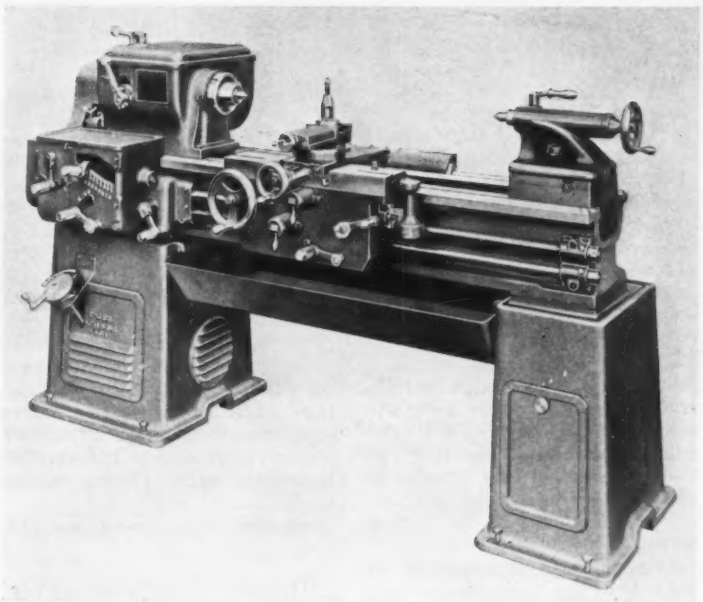
Circle Item 123 on postcard, page 257

Variable-Speed Engine and Tool-Room Lathe

A 16-inch variable-speed engine and tool-room lathe that offers infinitely variable spindle speeds ranging from 30 to 1500 R.P.M. is being introduced by the Carroll-Jamieson Machine Tool Co., Batavia, Ohio. The spindle is belt-driven and mounted in extra wide Timken bearings. Triple V-link belts provide ample pulling power for both production and tool-room requirements. The range of speeds provided by the gear drive is designed for extra heavy turning operations.

The gear-box provides forty-eight feeds and permits cutting forty-eight threads ranging from 3 to 184 threads per inch. Separate levers control longitudinal and cross-feed positive type clutches. The large cross-feed and compound rest dials have easily read graduations. Both feed-rod and lead-screw are provided. This model can also be furnished to swing 18 inches with bed lengths available up to 14 feet.

Circle Item 124 on postcard, page 257



Engine and tool-room lathe brought out by the Carroll-Jamieson Machine Tool Co.

"Sure-Bore" Boring-Bar Cartridge

The Portage Double Quick Tool Co., Akron, Ohio, is introducing a low-priced, micrometer-adjustable cutting tool cartridge unit for positive positioning and rigid clamping, with no backlash in either direction. Graduations are always visible; all inserts are carbide-tipped, sharpened, and ready for use.

With this "Sure-Bore" cartridge unit, it is a simple matter to make boring-bars, face mills, fly cutters, and other cutting tools requiring precision adjustment. Boring sizes range from 1 to 5 1/2 inches, with 1/4-, 3/8-, and 1/2-inch tool bits.

Circle Item 125 on postcard, page 257

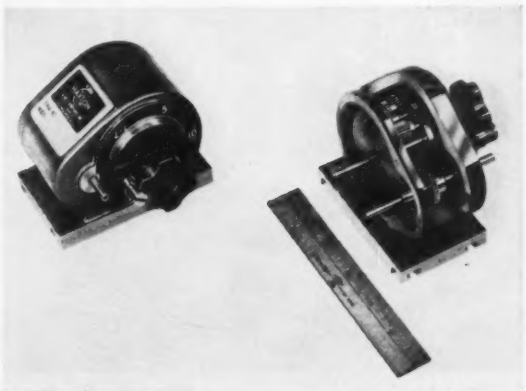
Haxton "Little Giant" Gear Reduction Unit

The Haxton Gear Co., East Rockaway, N. Y., has developed a small-size five-speed gear reduction unit. Speeds can be changed quickly and easily (while the unit is running) by simply turning a dial. The unit has gear reductions of 2 1/2, 5, 10, 25, and 50 to 1. A neutral station eliminates the need for a clutch. The housing is cast of aluminum, and input and output shafts are both mounted in ball bearings. The unit is 3 inches high and 3 7/8 inches long.

Two models are available: No. 100 B.B. is jig bored throughout and, because of its low torques and minimum backlash characteristics, is adapted for use in studying servo and control problems. The No. 105 D.R. is adapted for use where backlash is not of prime importance, and is well suited for gear reduction as a constant, two-direction, five-speed drive unit.

Circle Item 126 on postcard, page 257

"Sure-Bore" boring-bar cartridge unit



"Little Giant" gear reduction unit

Precision Dividing Heads for Cincinnati Universal Milling Machines

A line of precision dividing heads, designed primarily for their universal milling machines, has been announced by the Cincinnati Milling Machine Co., Cincinnati, Ohio. These dividing heads are accurately built for high-precision work and ruggedly constructed to handle gear cutting, cam milling, drilling, and boring. The dividing head spindle is mounted on precision, antifriction bearings, carried in a block having 360-degree peripheral clamping. Spindle nose and taper hole conform to the No. 50 milling machine standard. The block is mounted in a housing to allow 145-degree angular positioning of the spindle in the vertical plane.

The indexing arrangement at the side of the head consists of a crank with a retractable pin handle, sector for spacing, and reversible index-plate. Rotating motion of the crank is translated through a worm to a worm-wheel (40 to 1 reduction) keyed to the spindle. The worm is also mounted on precision ball bearings and is carried in a yoke which is eccentrically mounted in the block. This construction provides a means of quickly disengaging the worm to employ the direct-indexing method. For direct indexing, a small bracket, mounted on top of the dividing head, is fitted with a pin which engages holes drilled in the periphery of the spindle nose. This arrangement is desirable for set-ups requiring but a few indexes, such as used in milling hexagon bolt heads. The dividing head is completely enclosed.

Complete dividing head equipment includes a tailstock with two-point adjustable center, which can be swiveled 10 degrees above or below center; steadyrest; center for headstock fitted with driver and draw-bolt; and bracket for connecting headstock to driving mechanism. Several extra equipment items are available, including high-number indexing attachment, angle plates, raising blocks, and chucks.

Circle Item 127 on postcard, page 257

"Honite" Ceramicones for Barrel Finishing

Conical-shaped ceramic pellets for barrel finishing have been announced by Minnesota Mining & Mfg. Co., St. Paul, Minn. Called "Honite" brand Ceramicones, the pellets are said to make possible barrel finishing of many intricate parts which previously could not be handled in this manner because of lodging problems. Tapered ends permit access to holes for deburring, yet the broad bases prevent lodging; and the resistance of the pellets to wear enables them to maintain their original dimensions for a long time.

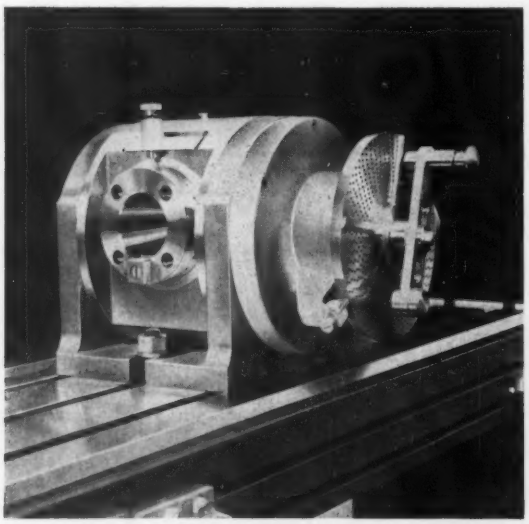
The pellets are also said to remove burrs and parting lines from molded plastic parts without scratching the fine surface produced in molding. The ceramic material is fused under high pressure to eliminate voids and thus make it resistant to the deteriorating effects of acids. The cones are 1/2 inch high, 3/8 inch through the base, and 7/32 inch across the top, and, therefore, able to reach virtually all work surfaces.

Circle Item 128 on postcard, page 257

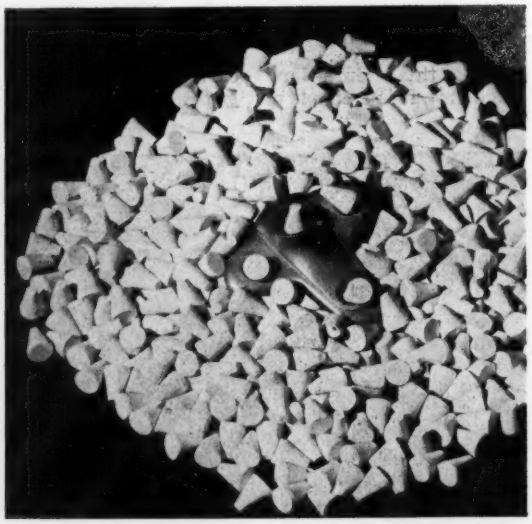
Roller Bearing with Separable Outer Race

A Type MCS-5130-C double-width radial roller bearing with separable outer race, bronze retainer and crowned rollers—designed to support the 3500-pound flywheel of a 30-inch series Dynamatic press drive at speeds up to 550 R.P.M.—is being made by the Rollway Co., Syracuse, N. Y. This drive is one of several models which the Dynamatic Division of the Eaton Mfg. Co., Kenosha, Wis., supplies to automotive, home appliance, aircraft, and ordnance industries and can be used for presses performing metal drawing operations.

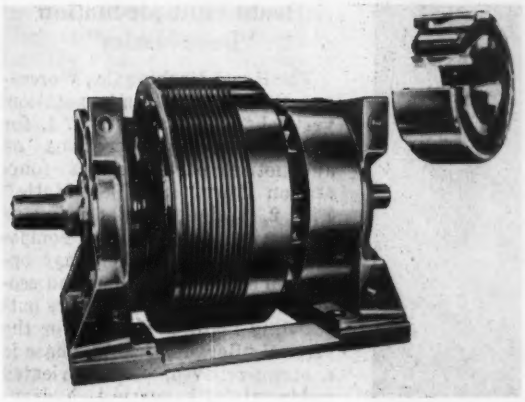
The bearing is constructed to enable the inner race and roller assembly to float in the outer race. Since the outer race is separable, the press drive-shaft can be with-



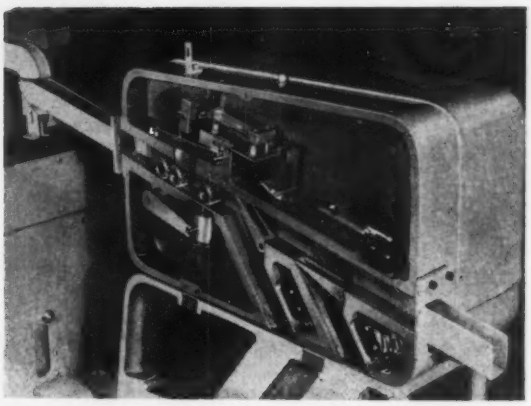
Precision dividing head brought out by Cincinnati Milling Machine Co.



"Honite" brand Ceramicones announced by Minnesota Mining & Mfg. Co.



Dynamatic press drive with Rollway roller bearing having a separable outer race



Probe type three-way gear classifier developed by the Michigan Tool Co.

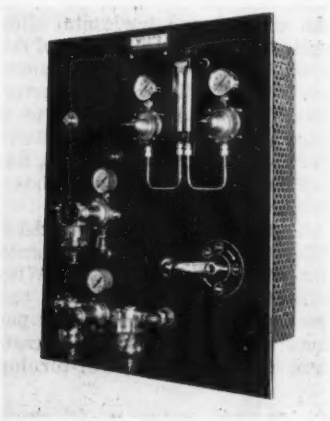
drawn easily without removing the outer race and roller assembly from the housing. The roller bearing illustrated has a bore diameter of 5.9055 inches, an outside diameter of 9.2520 inches and a width of 2 5/8 inches. Its rated load capacities in pounds at 25 and 1000 R.P.M. are 87,925 and 25,750 pounds.

Circle Item 129 on postcard, page 257

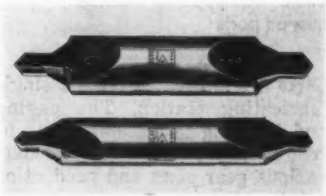
"METCO" Control Panel

A new "METCO" Type CP control panel recently introduced by Metallizing Engineering Co., Inc., Westbury, N. Y., makes possible a completely automatic metallizing production line. No hand-adjusted and hand-held operations are required. It can be set up for a completely controlled production run. All gas, oxygen, and air controls and wire feed are predetermined and set. The operator then stops and starts the metal spraying operations with a simple turn of the control handle. Without disturbing any adjustments, he can light, run, stop, and relight as often as the production run requires.

Circle Item 130 on postcard, page 257



Control panel for metal spraying made by Metallizing Engineering Co.



Whitman & Barnes combined drill and countersink

Combined Drill and Countersink

Whitman & Barnes, Plymouth, Mich., have announced production of a new type combined drill and countersink. This tool is of spiral flute design and has been developed to produce smoother, more accurate holes. The combined drill and countersink is available in the plain type, made of high-speed or carbon steel, in sizes 1 to 8 and in the bell type, sizes 11 to 18, in high-speed steel only. Both types have the new spiral flutes.

The number of sizes has been reduced from 13 to 8, thereby decreasing the number of tools necessary to cover most centering requirements. The drill sizes range from 3/64 to 1/4 inch in diameter with the length of the drill portion equal to the drill diameter.

Circle Item 131 on postcard, page 257

Automatic Three-Way Gear Classifier

An automatic, probe type, gear-size monitoring unit has been added to the three-way gear classifier line developed and built by the Michigan Tool Co., Detroit, Mich. The new model has a gear-gaging action based on "point contact" of individual probes, while previous models use master gears. The unit is particularly adapted for use where the gears go directly to the classifier before passing through a washer, and is readily adaptable to Michigan Tool's "Gear-O-Mation" system for complete automation of the gear production line.

Over-size, under-size, and correct-size gears produced on hobbers, shapers, shavers, or "Shear-Speed" machines are monitored automatically, using the pitch diameter as a reference base. The model has a three-point contact system—two lower stationary probes and one upper "floating" probe—that "senses" 100 per cent gear production from a single machine or a bank of gear-producing machines. Both a visual and electrical check of production accuracy are provided within the tolerances specified for the pitch diameter of the gear.

Gears enter the classifier from the side and continue down the inclined ramp through the probe-sizing operation. Those within the specified tolerances continue through the classifier to the next operation. Any over-size or under-size gears are automatically shunted and collected separately for salvage or scrap.

The operating mechanism of this classifier is simple. A Geneva

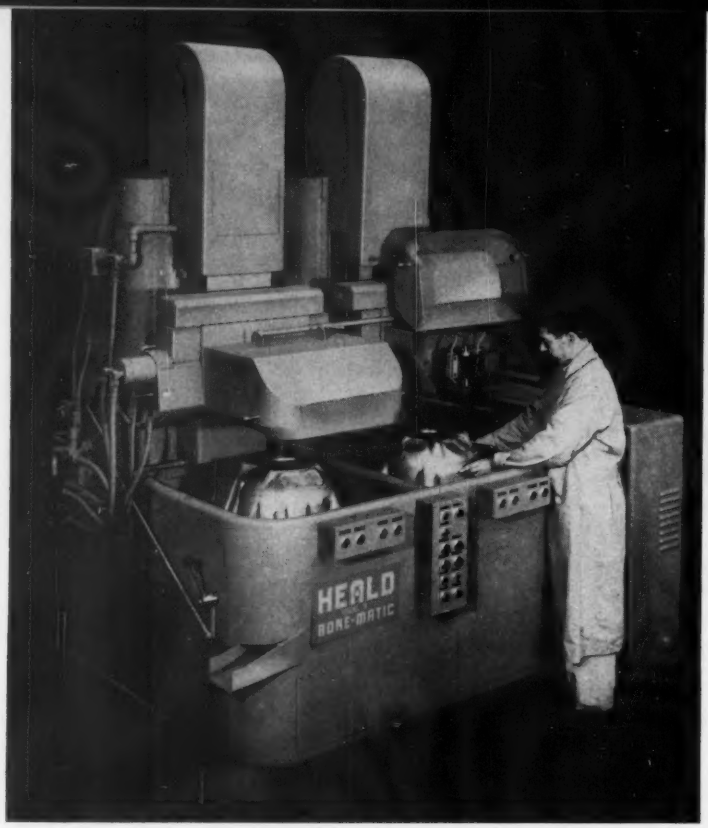
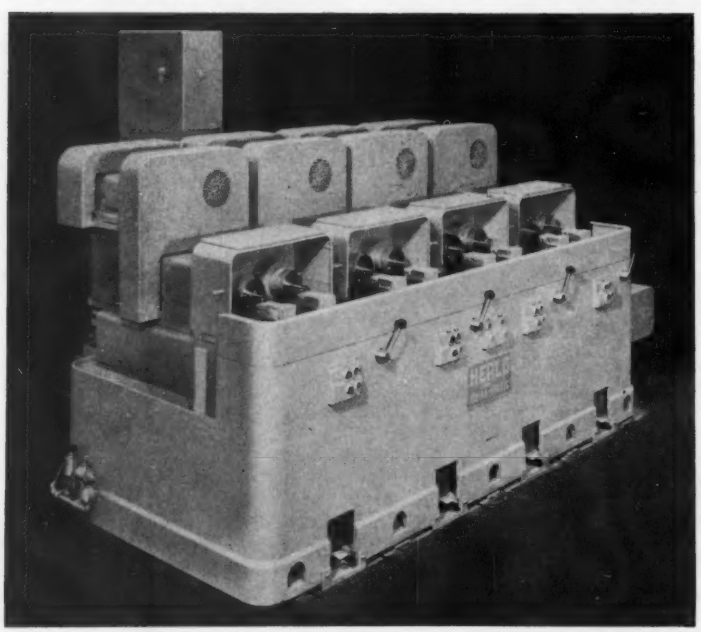


Fig. 1. Heald two-station "Bore-Matic" equipped to machine automotive transmission parts

type motion controls and times the probe movement as well as the escapement action that feeds gears to the probing station at a predetermined speed, depending upon the gear production rate. Maintenance is simple—all operating parts are lubricated from a single lubricating station. The gaging and feeding functions can be readily adjusted to accommodate various gear sizes and production rates.

Circle Item 132 on postcard, page 257



Heald Multiple-Station "Bore-Matics"

The Heald Machine Co., Worcester, Mass., has built a two-station, vertical "Bore-Matic," Fig. 1, for multiple boring operations on automotive parts and a four-station Model S "Bore-Matic," Fig. 2, designed for continuous production of refrigerator components. High production, easy operation and maintenance, and economical use of floor space are outstanding features claimed for the vertical "Bore-Matic." The base is a stress-relieved, steel-fabricated weldment with vertical, hydraulically operated slide units mounted on the column. These units can be arranged to carry a variety of tooling and can be angularly mounted.

Work-pieces are loaded on rotating fixtures mounted on vertically positioned precision boring heads. The boring heads are driven by individual motors mounted at the rear of the base. Sloping chutes permit chips to fall below the work where they may be removed manually or by means of a conveyor.

In the set-up shown in Fig. 1, the vertical slide accomplishes the boring and chamfering operations, and the horizontal slide generates the face of automotive transmission parts. Continuous production can be maintained by loading one station while the other station is in operation. The cycle control push-buttons are grouped at the front of the machine, and double push-buttons for cycle starting are located at each station.

Feed controls for rapid traverse, boring, turning, facing, and related operations are readily accessible and are available for both the vertical and horizontal slide units. The vertical slide unit of the standard "Bore-Matic" will handle parts up to 16 inches in diameter. The machine is adaptable to a wide range of work, particularly to the machining of flywheels, impellers, bell housings, clutch plates, and similar parts.

The Heald four-station Model S "Bore-Matic," Fig. 2, is designed for continuous production. With this machine, one operator can borize 240 refrigerator parts per hour. The operations on the cast-iron work-piece consist of turning

Fig. 2. Four-station Heald "Bore-Matic" tooled for borizing refrigerator parts

the piece to the required outside diameter and facing and chamfering the rim. Four hydraulically powered slide units are used, each having two boring heads and a single motor drive. Operating pressure is supplied to the slides by a 30-gallon-per-minute hydraulic power unit.

The rotating, air-operated, centrifugally damped, work-holding chucks mounted on the boring heads are interchangeable, making it possible to accommodate parts of different sizes. Tool-blocks are also designed so that the same tools may be used on different parts. Each of the four work stations is independently operated, two parts being machined simultaneously at each station. Air-operated fixture clamping is done by foot-pedal, and the cycle is controlled by push-buttons at each station. Chips are carried down sloping chutes to an automatic type conveyor and then to the right-hand end of the machine for disposal. Proper machine height for loading, as shown in Fig. 3, makes for ease and speed of operator movement from station to station.

Circle Item 133 on postcard, page 257

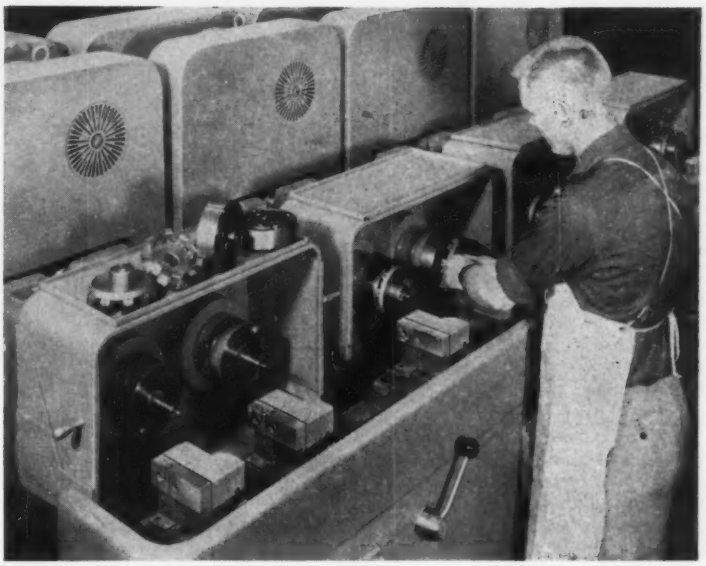


Fig. 3. Close-up of machine in Fig. 2, showing tools and work

Three-Dimensional Tracer Milling Unit

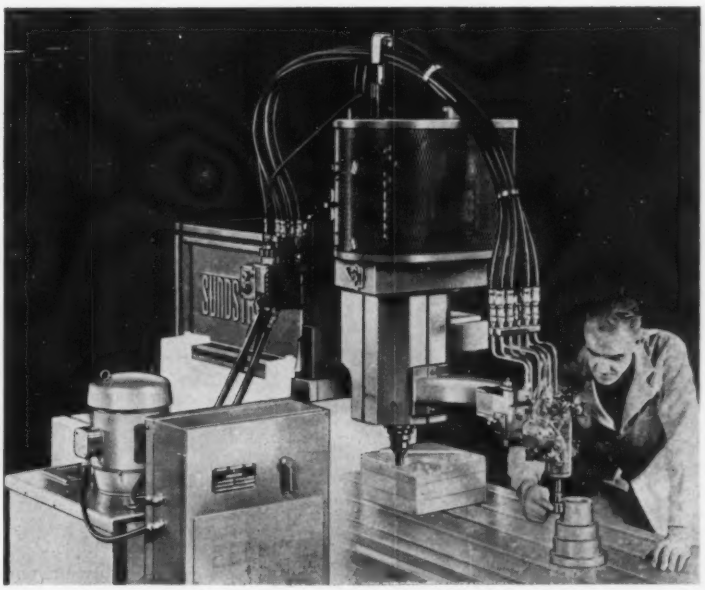
The Sundstrand Machine Tool Co., Rockford, Ill., has developed a three-dimensional tracer milling unit. The ram support of this unit has transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end. The tracer stylus arm also has several manual mounting positions to further increase the possible uses of the unit. Cuts can be taken on large work-pieces by moving the cutter rather than the work. With this arrangement, less floor space is required to do the work and greater accuracy can be maintained.

The transverse and longitudinal movements of the cutter have a range of 12 inches and the depth movement has a range of 8 inches. All three movements are manually controlled from a single pencil type stylus tracing unit to enable duplication of pattern contours on the work-pieces. Each movement has a quick-acting shut-off valve for independent use of any one movement. The cutter-head slide has a micrometer screw depth stop for accurate depth location for the full range of cutter travel. The linear and depth-duplicating speed of the cutter is variable within a range of 1 inch to 50 inches per minute.

The stylus has a positive lock adjustment on all three movements to facilitate proper location of the cutter in relation to the position of the stylus on the template. A quick-change positive lock stylus chuck is provided to permit changing from one size stylus to another without changing cutters.

The unit shown has a belt-driven 3-H.P. head with four possible speed changes of 200, 400, 900, and 1800 R.P.M. Also available is a 3-H.P. head with infinitely variable speeds between the range of 200 to 1800 R.P.M. In addition, 5-H.P. heads of either the four-speed belt-driven type or the infinitely variable speed type can be furnished.

Circle Item 134 on postcard, page 257



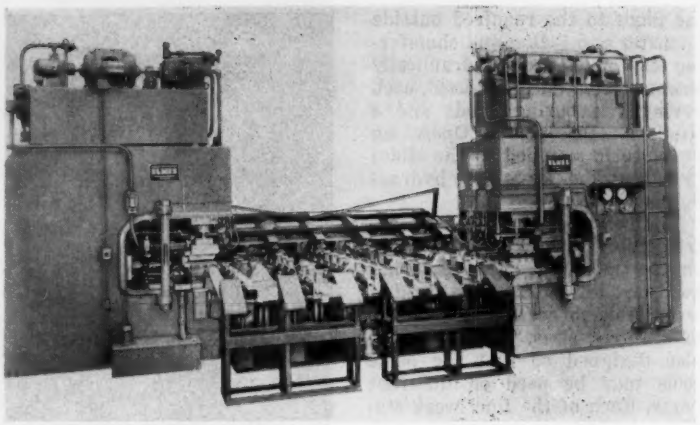
Sundstrand three-dimensional tracer milling unit

Tube-Reducing Press

A special tube-reducing press is a recent development of the Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio. This press removes a piece of tubing stock from a loaded magazine and carries it into the three-stage work station of the machine where the reducing operations are performed. It then removes the finished tube and deposits it in a tote box.

The press is a completely self-contained unit equipped with two C-frame type stationary ends, each having three 25-ton tube-clamping rams and three 10-ton reducing rams. The unit is designed to reduce the two ends of steel tubes which have a wall thickness of 0.062 inch. The ends of the tubes are reduced from a diameter of 2 inches to 1 1/4 inches. Production is at the rate of one tube every twelve seconds. Tubes up to 13 feet 6 inches and down to 54 inches in length can be handled automatically.

Circle Item 135 on postcard, page 257



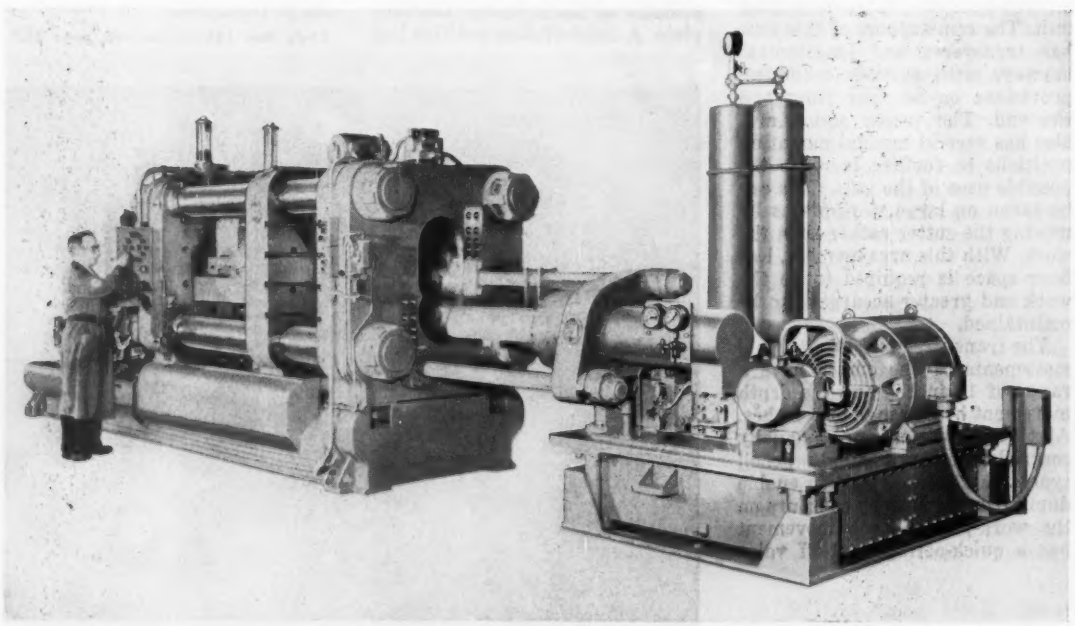
Automatic tube-reducing press developed by Elmes Engineering Division, American Steel Foundries

H-P-M Die-Casting Machine

An 800-ton die-casting machine, capable of producing large aluminum parts such as automotive grilles, transmission housings, motor blocks, outboard motor castings, and comparable large parts weighing up to 35 pounds, is announced by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The design of this cold-chamber machine incorporates a positive, self-compensating mechanical link-wedge that locks the clamp at the rated tonnage. Push-button control provides central screw adjustment of daylight and tonnage settings.

The machine is equipped with electric-hydraulic safety interlock. Control of strokes, slowdowns, and automatic cycling (including a three-core pull and ejector sequence), provide flexibility of operation. Die platens are 59 by 55 inches, and variable die heights (daylight) range from 34 to 16 inches.

An independent injection end permits ample open floor area for automatic ladling furnaces and other devices. Other outstanding features include positive pressure follow-through with no delay, plus complete control of the injection plunger.



Die-casting machine for producing large aluminum parts brought out by the Hydraulic Press Mfg. Co.

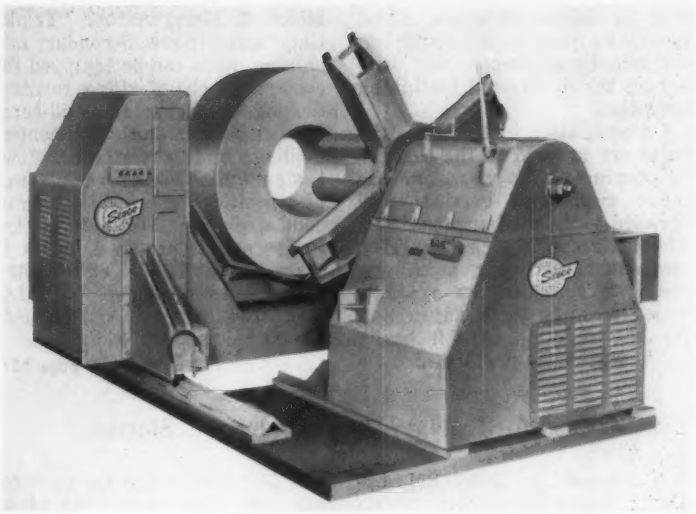
Both central hydraulic and bumper bar ejection add to the flexibility of this machine. Power input is 80 H.P. The machine has 9-inch tie-rods, heavy platens, and weighs about 81,000 pounds.

Circle Item 136 on postcard, page 257

Power-Lift Coil Loader

A power-lift coil loader, called the "Lift Loader," has been added to the line of machine tools and press room equipment manufactured by Sesco Inc., Detroit, Mich. This loader is designed to increase production and reduce to a minimum the down time for re-loading coil stock.

The lateral movement is easily obtained, as the "Lift Loader" is mounted on rails providing freedom for loading of coil. The coil is elevated to obtain core alignment and is then transferred laterally to the expander arms of the centering reel. The complete movement of the coil, both lateral and vertical, is powered electrically and is push-button controlled. The model shown is designed for loading a single coil. However, the loader can be built to handle multiple coils and coil loads up to 40,000 pounds.



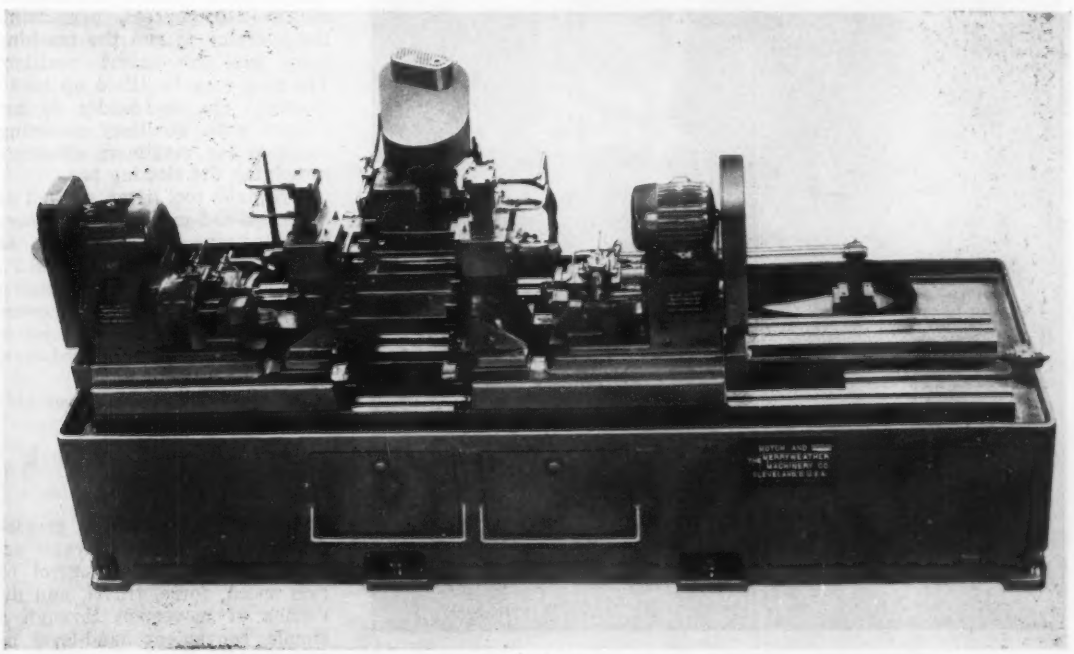
Sesco power-lift coil loader

Circle Item 137 on postcard, page 257

Double-End Transfer Machine

Cutting-off stock automatically and simultaneously performing double-end machining operations are accomplished on a machine designed and built by the Motch & Merryweather Machinery Co., Cleveland, Ohio. This machine feeds bar stock automatically to a circular saw type cutting-off station and transfers the cut-off piece to two opposed secondary machining heads.

Stock fed to the pre-set stock stop is retained in a vise and two transfer carriers during the cut-off operation. Carriers fastened to two continuous chains of the transfer mechanism bring the cut pieces forward to the double-end machining station. The pieces are then positioned for endwise loca-



Motch & Merryweather double-end transfer machine with automatic stock feed

tion by hardened shoes, lifted from the carrier by self-centering, self-equalizing clamps, and held during the double-end machining operation.

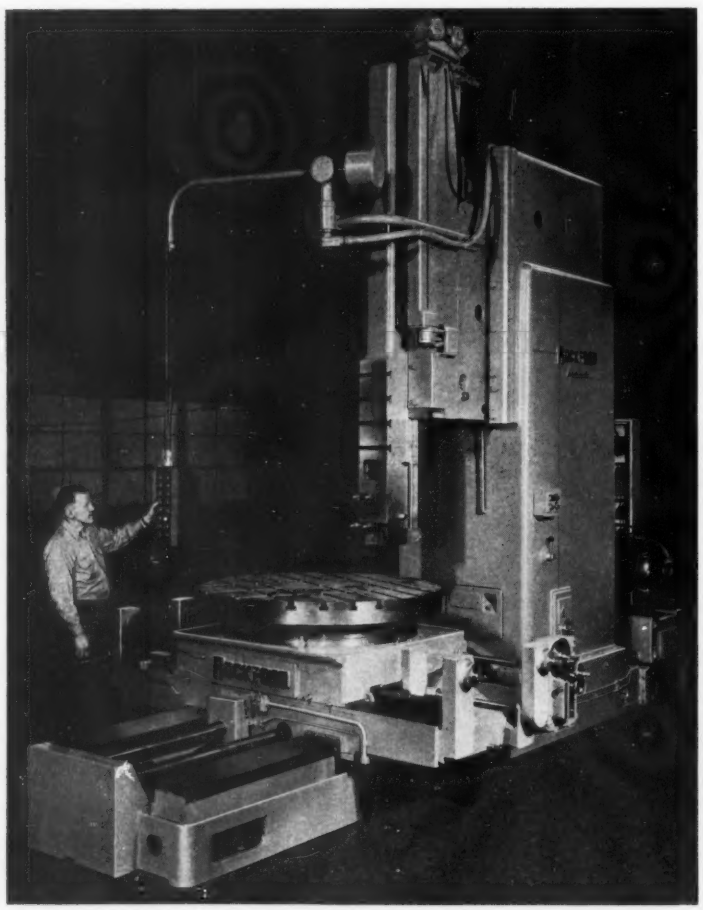
On completion of the work, the parts are lowered to the carriers by opening of the vises, and the index mechanism carries them forward to the discharge position. The stock stop, one chain carrier, vise, and one secondary machining head are contained on a saddle which permits quick adjustment for lengths from 5 to 60 inches.

The cut-off is performed by a Motch & Merryweather "Triple-Chip" circular saw. Secondary machining heads can be equipped for centering, chamfering, turning, drilling, or boring. Box-mill-turning can be combined with center-drilling and chamfering. Two basic machine sizes cover a range of capacities for cutting tubing or solid stock from 1/4 inch to 1 1/2 inches and 1 inch to 4 inches in diameter. Hydraulic and electrical equipment conforms to J.I.C. standards. Provision can be made for magazine stock loading.

Circle Item 138 on postcard, page 257

Rockford Heavy-Duty Hydraulic Slotter

A heavy-duty, Model SM, hydraulic slotter is now being manufactured by the Rockford Machine Tool Co., Rockford, Ill. This addition to the company's line is built in stroke-length capacities of 36 and 48 inches, and is designed for accurate, rapid machining of all kinds of metals. An outstanding feature is pendant-actuated control of all cross, longitudinal, and rotary movements.



Push-button-controlled heavy-duty slotter built by the Rockford Machine Tool Co.

The machine is equipped with full hydraulic drive. Two speed ranges, with servo control to the pump, provide for stepless variation of cutting speed from zero to maximum in either range. The hydraulic feeds are also arranged for stepless variation from zero to maximum. Feeds and speeds are both controlled from the pendant.

Longitudinal, transverse, and rotary movements are operated and selected from the push-button station of the machine. No levers are required for engagement of any feed or traverse movement. Two-speed traverse is available, enabling the operator to position the work accurately without manual movements, although manual control of all movements is available from either side of the machine.

The built-in dividing head is arranged for power operation. A predetermining counter automatically stops the table for any selected number of turns within one-tenth of a revolution. The position of upper and lower reverse dogs on the ram may be changed from the push-button station, enabling the operator to lengthen or shorten the stroke without using levers or cranks. The ram may also be locked by means of a button located on the pendant.

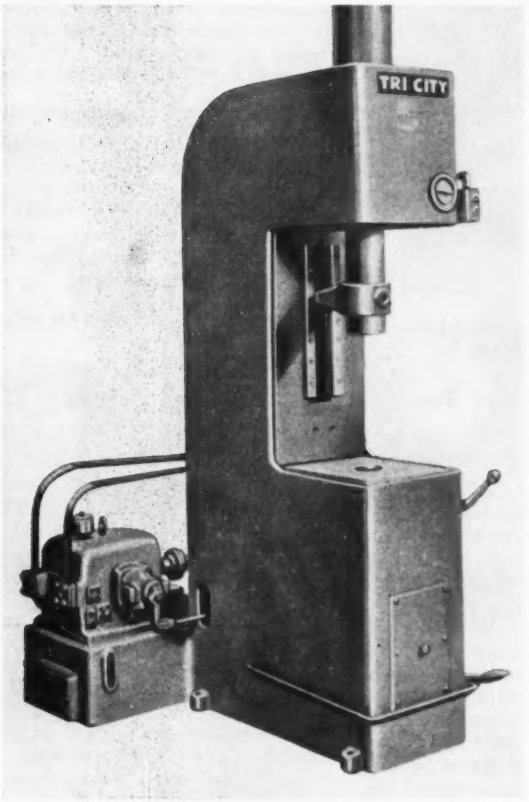
The counterbalanced pendant swings 240 degrees, permitting the operator to run the machine from any convenient position. The ram may be tilted up to 10 degrees. The tool-holder is arranged with auxiliary clamping surfaces for maximum efficiency in holding the slotting bar.

Hydraulic tool lifter, as well as hardened-and-ground saddle ways and bedways are available as optional accessories. A 40-H.P., variable-delivery, radial piston pump is used for hydraulic power. Automatic pressure lubrication is provided for the ram, bedways, and saddle ways.

Circle Item 139 on postcard, page 257

Fluid-Power Gooseneck Presses

Fluid-power gooseneck presses designed to give the operator accurate and sensitive control of ram speed, force, travel, and direction of movement through a simple, convenient hand-lever or foot-pedal are being manufactured by the Tri-City Tool & Machinery



Tri-City fluid-power gooseneck press with hand-lever or foot-pedal control

Duplex gear-chamfering machine built by Modern Industrial Engineering Co.

Corporation, Rock Island, Ill. These presses have been developed to speed up production on manifold forcing, stamping, broaching, assembling, straightening, manufacturing, and general pressing operations.

The presses are sturdily constructed with three sides open; large daylight capacities; deep working throats; low platens, and detachable tables; long, adjustable ram travel; sensitive ram controls; variable volume pumps; and other unique features.

Circle Item 140 on postcard, page 257

Burr-Master Duplex Gear-Chamfering Machine

The Modern Industrial Engineering Co., Detroit, Mich., has brought out a single-station deburring and chamfering machine that chamfers the teeth on both sides of a gear simultaneously. The Model BME-14 Duplex Burr-Master machine, illustrated, removes the sharp edges on the ends of gear teeth and simultaneously eliminates the burrs resulting from the gear-cutting process.

Spur gears, helical and straight-sided gears as well as involute form splines with pitch diameters of 5/8 inch to 6 1/2 inches can be handled on the duplex machine at production rates ranging up to 5 teeth per second on each side. At the end of the automatic chamfering cycle, the electric clutch stops rotation of the work-piece, with the cutters in the "out" position for easy loading and unloading.

Fixtures for this machine can be replaced with other tools when production must be shifted to a new gear or spline. Tool equipment developed on a master machine in the builder's plant can be shipped to the customer's plant and simply dropped into place. The complete change-over takes about fifteen minutes. With this pre-set tooling there is no need for trial cuts or set-up gaging, as the machine produces a chamfer to the desired tolerances with the first cut.

Regrinding tools is equally simple. Only the cutter and locating face of the dovetail form tools have to be ground, relief grinding being eliminated. With this arrangement, each tool can be reground several hundred times, thus giving exceptionally long life. Replacement cutters are simply brought up against a stop to insure accurate cutter alignment.

The machine is equipped with upper and lower cam-actuated rocker tool assemblies; precision ball bearing intermittent indexing assembly with provision for radial adjustment of pilot gear for radial tooth location; and ball-bearing V-belt drive which is totally enclosed by the necessary safety guards. Construction is in accordance with J.I.C. electrical standards. The 1-H.P. motor has a speed of 1200 R.P.M. and operates on 220/440 volt alternating current. The machine requires a floor area 32 by 42 inches and weighs 1800 pounds.

Circle Item 141 on postcard, page 257

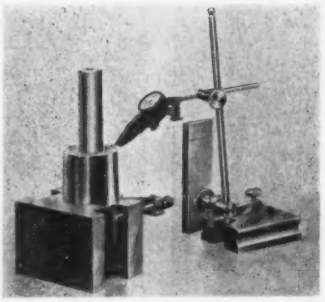
Wet Abrasive Cutting Machine

A heavy-duty, high-speed wet abrasive cutting unit—said to cut practically any metal and other hard materials—has been brought out by the Campbell Machine Division, American Chain & Cable Co., Inc., Bridgeport, Conn. This Model 64 "Cutmatic" is an oscillating type machine in which the wheel and work are fed manually and work clamps are operated by a foot-treadle. The oscillating unit, power-driven by a 1/3-H.P., geared-head motor, facilitates cutting medium-sized bar stock and large cross-sections and shapes.

Equipped with a large diameter Allison abrasive cutting wheel—up to 18 inches for certain applications—it will sever sheets, angles, channels, pipes, tubes, and solids of practically all materials. Designed for use in metal-working shops, factories, mills, foundries, and maintenance shops, it is capable of cutting solid bars 3 inches in diameter, tubing up to 4 inches in diameter, and steel plate 6 inches by 1 inch at speeds of approximately four seconds per square inch of material cut. The swivel type, foot-treadle-operated vise can be rotated from 0 to 45 degrees and has a maximum opening of 4 inches for 45-degree cuts.

A large, wheel-mounted, separate coolant tank permits easy removal for chip cleaning. A 10-H.P., totally enclosed, fan-cooled motor drives the abrasive cutting wheel.

Circle Item 142 on postcard, page 257



Test indicator introduced by Standard Gage Co., Inc.

"Check Master" Test Indicator

A "Check Master" test indicator, designed to facilitate both set-up work on a surface plate and the truing of pieces in machine tools, is a recently announced product of the Standard Gage Co., Inc., Poughkeepsie, N. Y. The versatility of this instrument is said to be greatly increased by its mounting arrangement, which permits it to be used in practically any position while maintaining good visibility of the dial.

The indicator is made in two models, one having graduations reading to 0.0001 inch, while the other can be arranged for reading to 0.001 inch on widely spaced divisions as well as to 0.0001 inch. The latter model, when fitted with a longer contact arm, is able to get into places which would otherwise be inaccessible. Either the short or the long contact arm can be positioned over a full 180-degree arc but the latter extends sufficiently beyond the nose of the instrument to facilitate gaging in out-of-the-way spots.

The indicator is supplied with both a toolpost bar of rectangular section and a round collet bar. The mounting clamp and the two dovetail slides permit "on center" mounting, both horizontally and vertically, with the collet bar in line with the contact arm.

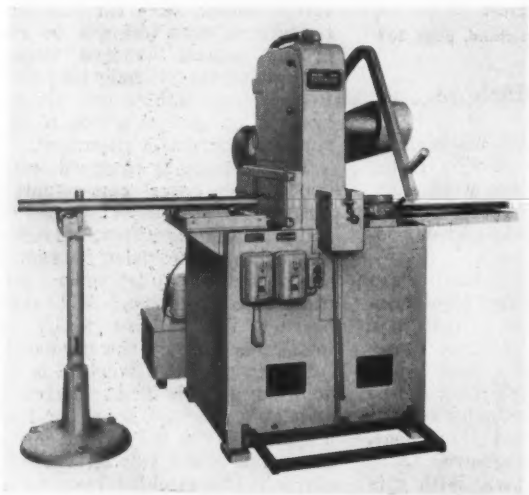
Circle Item 143 on postcard, page 257

"Lorco 300" Heavy-Duty Tumbling Barrels

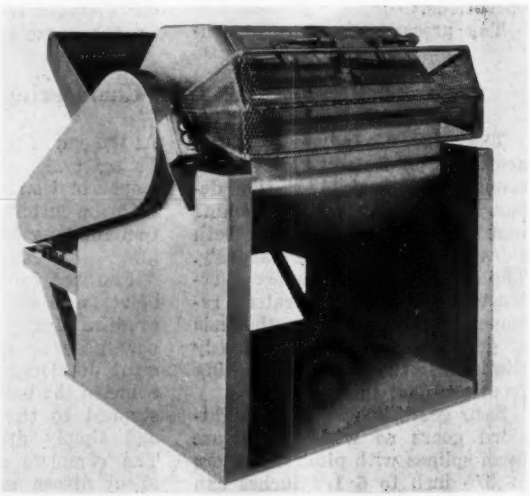
A "Lorco 300" series of heavy-duty tumbling barrels built for precision finishing of large-quantity loads weighing from 700 to 3800 pounds has been announced by the Lord Chemical Corporation, York, Pa. The line includes six octagonal barrels (one or two compartments) ranging in total capacity from 6.9 to 36.6 cubic feet. Barrel diameters are 30 and 36 inches, and lengths run from 16 inches to 5 feet.

These barrels are built to withstand long runs under severe operating conditions. The over-size Reeves motor drive is powered by an NEMA type motor of 1 1/2 to 7 1/2 H.P. Controls, manufactured by Allen Bradley, include forward, reverse, off, and jog switches, arranged in a water-tight mounting. A twenty-four-hour timer is available as optional equipment.

Circle Item 144 on postcard, page 257

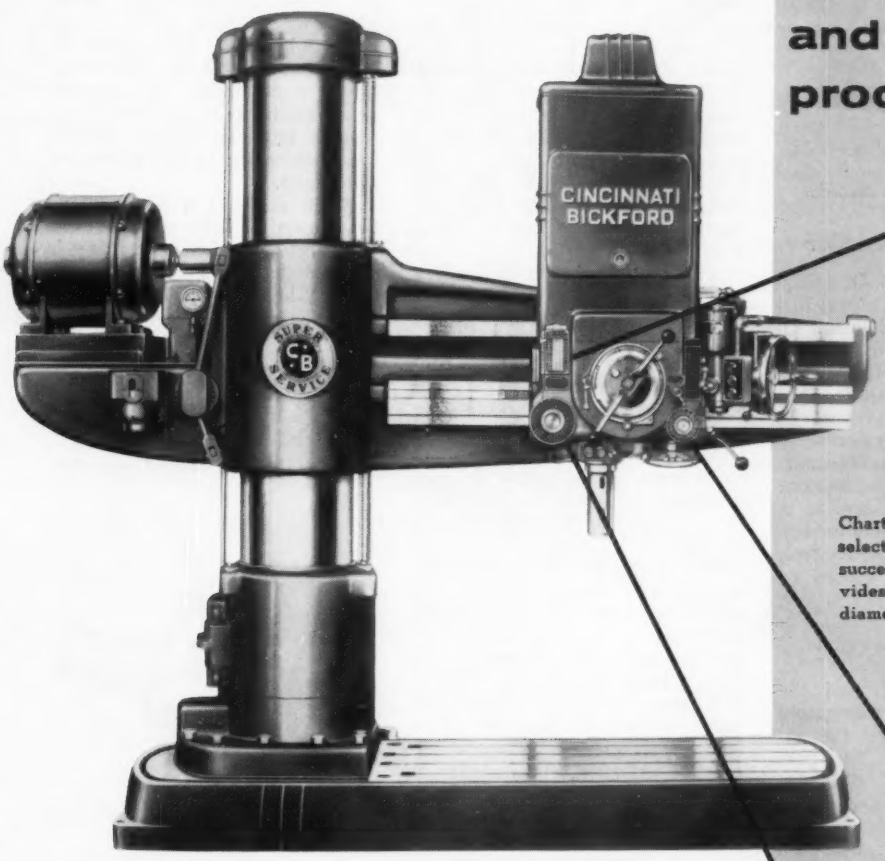


"Cutmatic" wet abrasive, high-speed cutting machine with oscillating motion



Heavy-duty tumbling barrel announced by the Lord Chemical Corporation

HEAD WORK... saves time ...controls and speeds production!



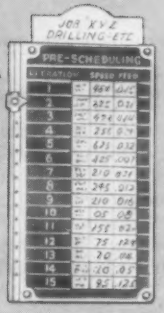
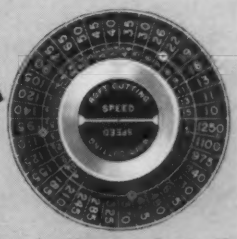


Chart guides the operator in pre-selecting speeds and feeds for succeeding operations. It provides a permanent record of tool diameter, speed and feed.

Hydraulically pre-selects all 18 feeds. Positive geared tap leads and feeds are quickly pre-set.



Hydraulically pre-selects all 36 speeds. Speeds and tool diameters are shown in large easy to read figures.

This NEW modern head gives an accelerated production and an increase in accuracy of performance ... the greatest advance in simple and positive control in Radial Drill history.

Two convenient direct reading dials control the automatic shifting of sliding gears. While the tool is cutting, merely set the dials to the speed and feed for the next operation. As the spindle is stopping for inserting the next tool, the shifting is done hydraulically ... directly, quietly and quickly. No other operations—no loss of time. Write for catalogs.

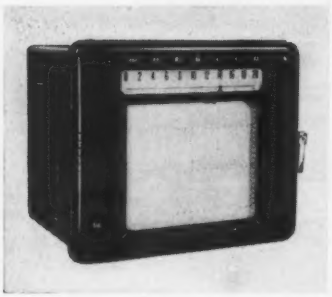
CINCINNATI BICKFORD

SUPER SERVICE RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

Cincinnati 9, Ohio, U.S.A.

GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin.



Electronic potentiometer-recorder

Potentiometer-Recorder

Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill., has announced the development of a Series 8000 electronic potentiometer-recorder of the null-balancing type. This unit is completely self-contained and requires only an external sensing device. It has been designed to provide maximum accuracy, simple operation, and minimum maintenance. It is available in a wide range of models which measure, indicate, control, and give a permanent record of such variables as temperature, speed, strain, and other quantities that can be resolved into electrical signals.

Both the chart rolls and the chart and recorder drive assembly swing out 180 degrees for inspection or servicing. The pre-standardized calibrated slidewire remains in positive contact at all times. The instrument is available in a wide selection of standard scale ranges.

Circle Item 145 on postcard, page 257

Groove-Checking Comparator Gage

A high-precision, Swiss-made instrument designed to simplify checking of internal groove depths is being introduced by the Portage Double Quick Tool Co., Akron, Ohio. This device, called the "InteRapid" groove-checking comparator gage, is said to be exceptionally versatile. It has a capacity for gaging grooves from 3/8 inch to 6 inches in diameter. Serrated hinge joints keep the gaging tips parallel when taking wide measurements.

A large meter type face offers easy readability and is graduated in increments of 0.0005 inch. A glance indicates whether work is over or under size, and by precisely how much. The gage gives accurate three-point checking for production runs, or two-point checking for single units and short runs. It is useful on conventional bore and hole checking, in addition to internal groove checking.

The instrument is set by turning the dial to zero reading and adjusting arms to gage-blocks, micrometers, or ring gages. The dial also has a fine adjustment device. A lever retracts the measuring arms 0.400 inch to protect them while the instrument is being positioned. With the smallest tips attached, the instrument can be used to gage a 1/4-inch hole. Equipment includes short and long groove tips, button tips for hole checking, and flat tips.

Circle Item 146 on postcard, page 257

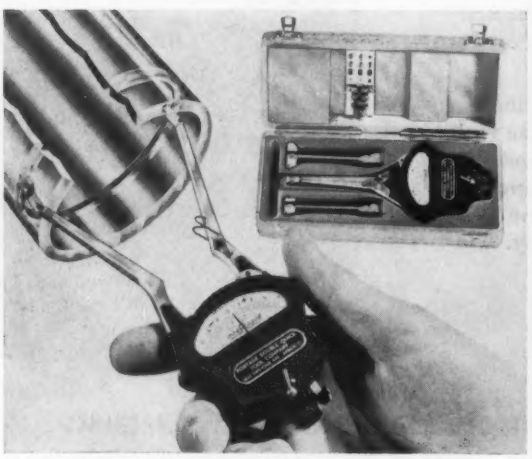
Self-Opening Thread-Rolling Heads

A series of basic National Acme-Fette design, self-opening thread-rolling heads is being offered by the National Acme Co., Cleveland, Ohio. The Series N heads may be used in either rotating or non-rotating spindles and are adaptable to use on almost any type of lathe, automatic, threading machine, drill press, or similar equipment.

When used as a non-rotating head, opening is by means of the "pull-off" method and resetting is accomplished by moving a hand-lever. When employed as a rotating type head, operation is by means of an outside yoke. Designed for fast, accurate rolling, the series includes four head sizes covering capacities from 1/16 to 3/4 inch.

Circle Item 147 on postcard, page 257

Fig. 1. National Acme self-opening thread-rolling head



"InteRapid" groove-checking comparator gage introduced by Portage Double Quick Tool Co.

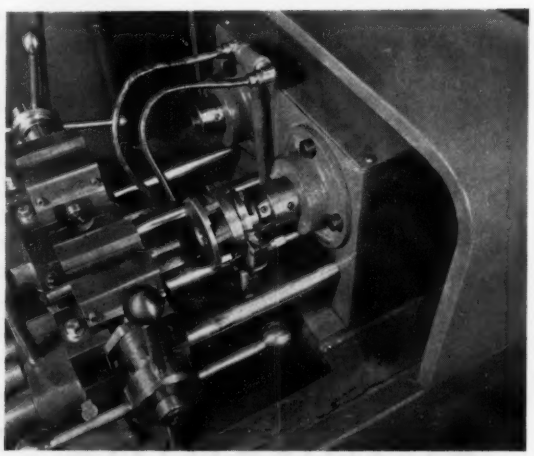


Fig. 2. National Acme self-opening thread-rolling head in operation on Kent bolt threader

(This section continued on page 244)

No other automatic on the market provides as high a degree of accuracy for work up to 2" diam. as the Brown & Sharpe No. 4 Automatic Screw Machine! And its advanced design permits top productivity on every job. For example: Super-precise spindle construction allows limits as close as 0.0003" — even at top speeds! Engineered production rates for each job assure maximum precision and efficiency under all conditions — hold repetitive production to close tolerances. A large, extra-convenient turret speeds set-ups and adjustments. In addition, electric control allows tools to be "jogged" easily into position; or a complete cycle to be run through by hand. And the No. 4's exclusive spider-wheel stock loader enables even a 100-lb. girl operator to easily engage a 2" bar! The unique capabilities of the No. 4 Automatic are making possible new profits in precision production — even on critical jobs like the one illustrated. It's the most *practical* automatic for all larger precision work. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, R. I.

THE MOST ACCURATE AUTOMATIC for larger work!

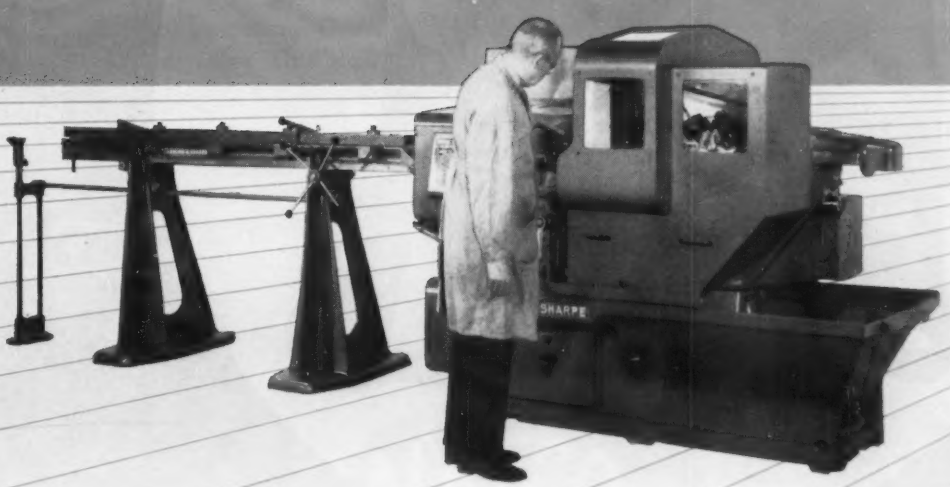
. . . the Brown & Sharpe No. 4 Automatic Screw Machine

MACHINE SPECIFICATIONS

Stock diameter	to 2"
Stock diameter (with outside feed)	to 2⅜"
Speed range	1965 to 17 R.P.M.
2-speed combinations	168
Speed ratios (12)	2.2:1 to 13:1

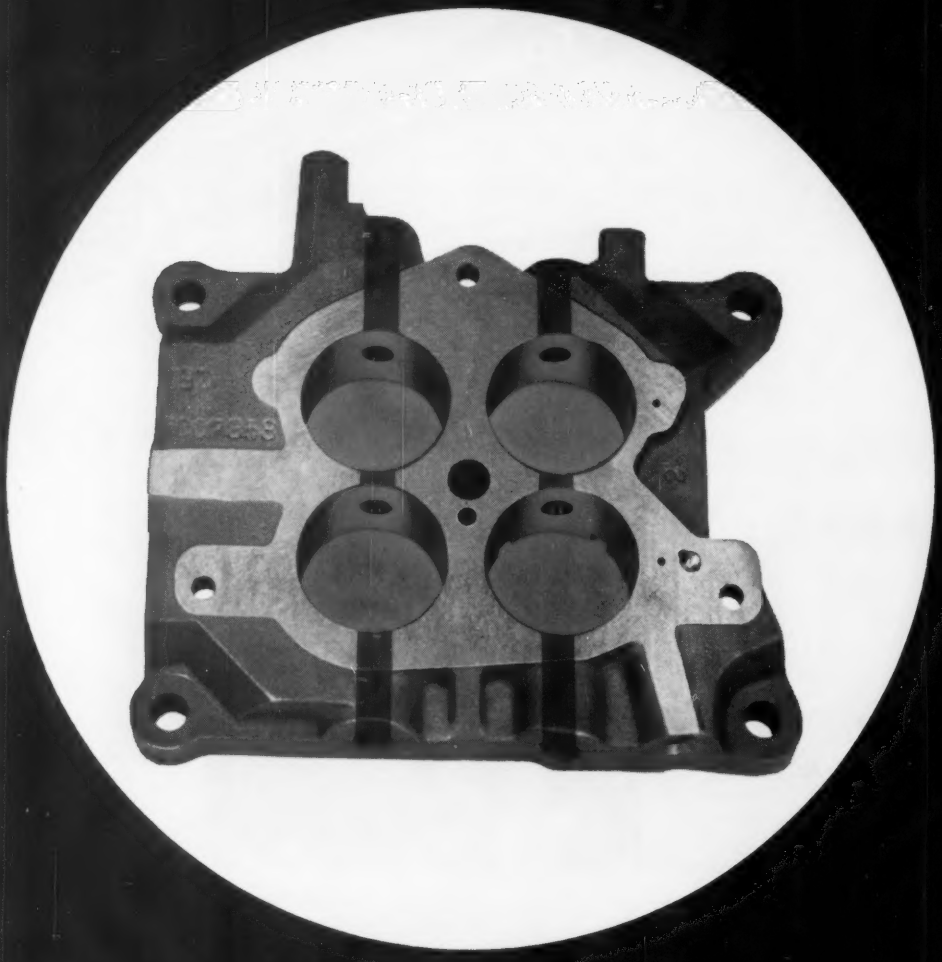
Even this Job is Easy on the No. 4!

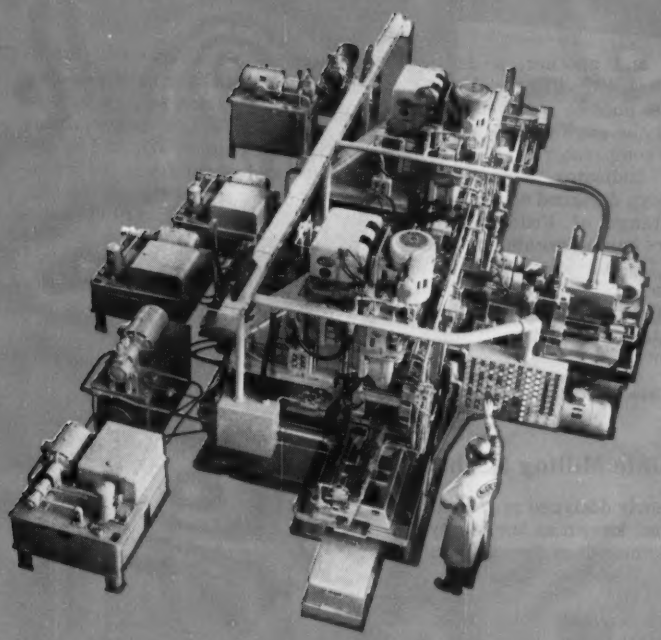
Tolerances:
Bore I.D. 0.0003" to 0.0004"
Concentricity of bore 0.0005"
Large O.D. 0.0005"
(Overall diameter of work approx. 2")



Brown & Sharpe

Here's Automatic Production On High-precision Parts





When is fast transfer production limited by precision requirements? This frontier is steadily being pushed back by Natco engineers in new Holeway processing machines.

Take this throttle body, for example. The large holes are reamed to *limits of .0015" for location, .0003" for size, 125 microinch* finish! Production—*600 parts per hour!*

Natco's high-speed gun-drilling heads give required finish in interrupted throttle-shaft holes without reaming. Size is held to within .001".

Many unusual problems are solved in locating, holding and positively controlling light-weight parts between stations at high transfer speed. Chip disposal is automatic; cutting oil is filtered for re-use.

Here's the sequence of operations. Combination rough and semi-finish ream four large holes. Gun drill two holes (two breakthroughs each). Finish ream four large holes.

Whenever fast, automatic production makes sense, don't let high-precision requirements stop you. A Natco engineer can tell you in a hurry whether it's feasible and how the job can be done.

National Automatic Tool Company, Inc.

Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

NATCO

Notes from Natco...

Beating the Index Hex

Common design dilemma . . . heavy rotating tables and high-speed indexing just don't want to mix. Priding ourselves on being good mixers, we added a hydraulic decelerating device, giving us tables that index faster than ever and still stop on a gnat's eyelash.

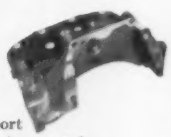
Automatic Squirt

Universal joints universally demand frequent lubrication. Our adjustable joint-drive heads now include automatic lubrication. Once the timer's set, the oil will jet . . . at any time interval you select. One more thing the operator can forget about.

One Will Get You Four

Here's an investment return that makes Florida real estate look like shaky speculation. Sixteen months ago one of our customers bought a new Natco light sensitive multi-driller and tapper. Cost . . . under $5,000. To date they report direct labor savings of $20,000.

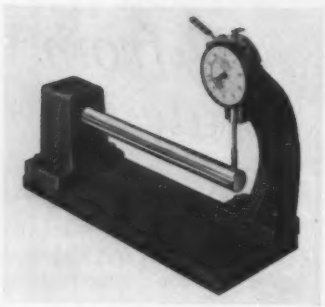
Processed by Natco Machines



Part: Front Axle Support
Machine: Natco 3-way horizontal
Operations: Drill 7 holes; Core drill 1 hole; Combination drill and chamfer 4 holes; Combination drill and spotface 1 hole; Tap 11 holes
Production: 16 per hour

Part: Crankshaft
Machine: Natco trunnion type
Operations: Drill, face and tap 1 hole; Drill, chamfer and ream 6 holes; Drill, semi-finish and finish ream 1 hole; Drill and ream 1 hole; Tap 6 holes
Production: 42 per hour

Part: Steering knuckle
Machine: Natco trunnion type
Operations: Spotdrill 4 holes; Drill 5 holes; Spotface 5 holes; Ream 2 holes; Combination ream and counterbore 1 hole
Production: 250 per hour



Deep throat dial thickness gage

Deep Throat Dial Thickness Gages

A new series of adjustable dial bench gages for measuring the thickness of tubing, sheet material, and similar work is announced by the Federal Products Corporation, Providence, R. I. These gages are equipped with precision mandrels on which the work is positioned and a Federal full-jeweled, low-friction dial indicator which can be read easily.

The throat depth of these versatile gages can be varied in increments of 1 inch by relocating the dial indicator support arm in holes provided in the gage base and by sliding the mandrel the required distance. One model has an adjustable throat depth of from 4 to 8 inches and another, a depth of from 8 to 12 inches. Also, the mandrel may be removed entirely so that the gage can be used as a simple comparator.

The indicator support arms have been designed so that a complete range of Federal dial indicators having regular type backs can be interchanged without modification. It is possible to obtain special mandrels, dial indicators, or contacts to meet individual requirements.

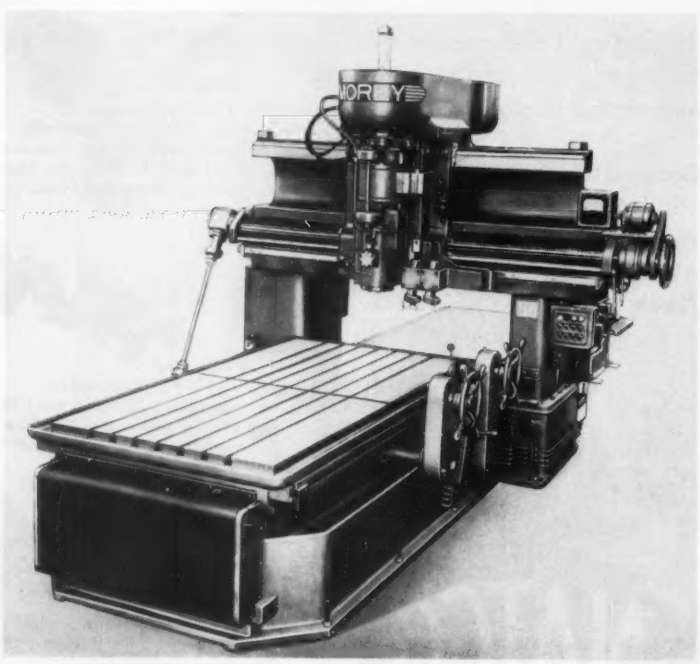
Circle Item 148 on postcard, page 257

Profile Milling Machine

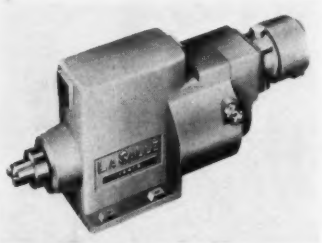
A newly designed profile milling machine, known as the Morey No. 50MA, has been brought out by Morey Machinery Co., Inc., New York City. The machine illustrated has a table 48 by 120 inches. The width between columns is 60 inches and the distance between table and spindle 21 inches. The spindle is driven by a 40-H.P. motor with provision for eighteen speeds ranging from 44 to 4800 R.P.M.

This machine is also available with tables 48 by 48 inches, and in lengths, increasing in increments of 2 feet, up to 144 inches. Additional widths and lengths are available to suit the customer's requirements. Equipment is adapted for hand profiling of ferrous and non-ferrous metals. Also available are power feeds with speeds up to 320 inches per minute and power feeds for transverse movement, vertical tracing, 360-degree tracing, or three-dimensional tracing systems. The machine is equipped with power feed to table and infinitely variable feeds from 0 to 160 inches per minute.

Circle Item 149 on postcard, page 257



Profile milling machine brought out by Morey Machinery Co., Inc.



LaSalle automatic power wrench

Automatic Power Wrench

A two-speed, fully automatic power wrench with controlled torque has been announced by LaSalle Tool Inc., Detroit, Mich. This tool is synchronized with the machine cycle of the production line equipment to automatically engage and disengage the work and provide controlled torque.

The wrench is a self-contained unit. It is automatically lubricated and designed to operate on conventional machine tool principles —with high-speed, low-torque approach; low-speed, high-torque clamping; and high-speed, low-torque return.

It features a fluid motor drive with a sight gage to indicate the fluid level. The fluid motor drive is adapted to clamping light parts or parts with thin-walled areas without the danger of fracturing them. This controlled positive clamping is said to practically eliminate breakage of cutting tools.

The automatic power wrenches are designed to fit any special or standard machine. They are mounted on special plates for use in vertical, horizontal, or angular positions. Two standard sizes are available—a small model with a torque capacity from 0 to 800 inch-pounds and a large model with a torque range from 800 to 5000 inch-pounds.

Circle Item 150 on postcard, page 257

(This section continued on page 250)

Here's what the **SUNNEN** folks wrote us recently about their Sidney Lathes:

TELEPHONE: CYPRESS 2100

SUNNEN PRODUCTS COMPANY

Automotive Service Equipment • Precision Honing Machines

7910 MANCHESTER AVENUE, ST. LOUIS 17, MISSOURI

Our 16" Sidney has proved to be everything Sidney said it would be.

We have made many odd shaped dies and it will duplicate as accurately as a master part or template.

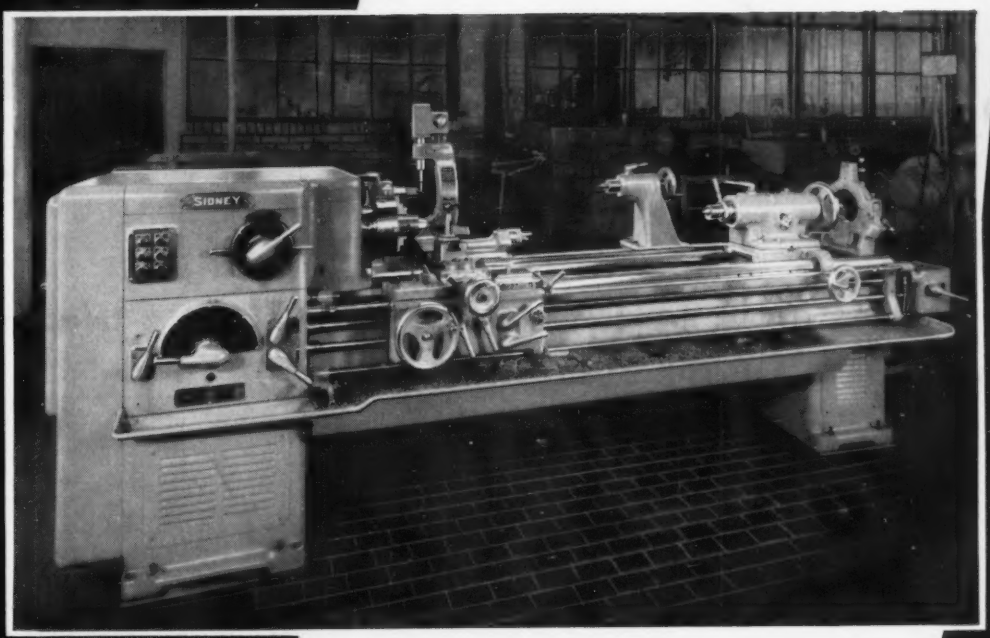
The Sidney is also easy to operate, the height is just right and all levers are conveniently located.

It is a real pleasure to operate a Sidney.

Cordially,

SUNNEN PRODUCTS COMPANY

George Maechling
Tool Room Foreman



SIDNEY FLUID TRACER LATHES

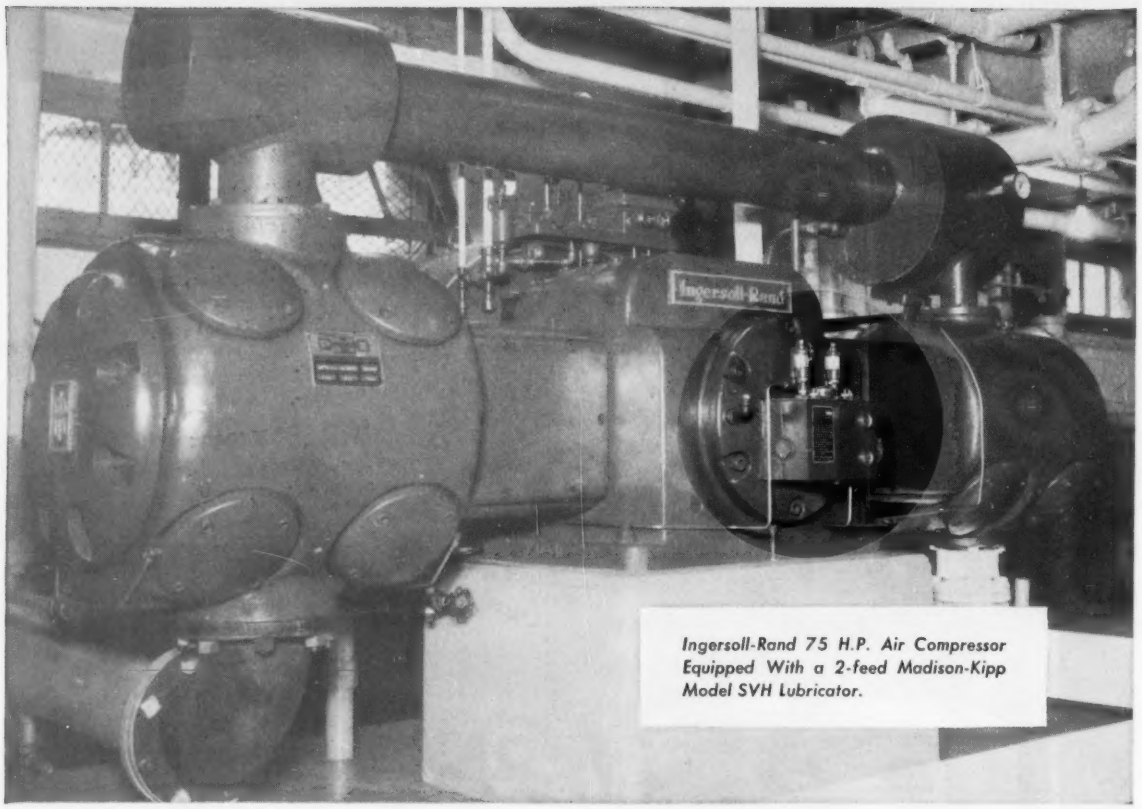
For you . . . as well as for Sunnen Products Company of St. Louis and scores of other leading makers of precision equipment . . . Sidney Lathes can do a terrific job . . . ECONOMICALLY!

The sensitive tracer head transfers every change in contour from any master piece or template to the cutting tool. A separate control switch turns off the tracer motor while the machine is performing standard lathe work.

WRITE FOR BULLETINS

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904



Ingersoll-Rand 75 H.P. Air Compressor Equipped With a 2-feed Madison-Kipp Model SVH Lubricator.

Machines of great performance use the most dependable oiling system ever developed

MADISON-KIPP

Fresh Oil ... by the measured drop, from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy, where oil under pressure fed drop by drop can be installed. There are 6 models to meet almost every installation requirement.

kipp

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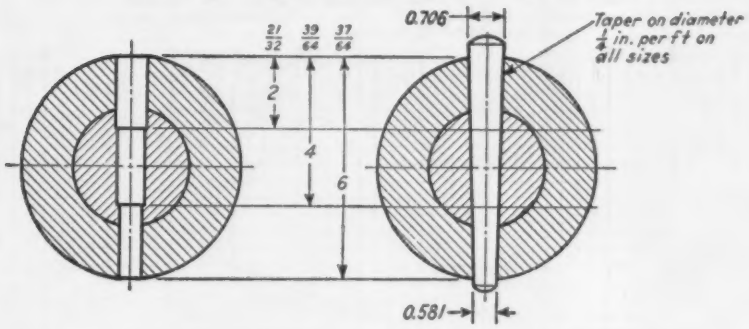
AMERICAN STANDARD MACHINE PINS—6

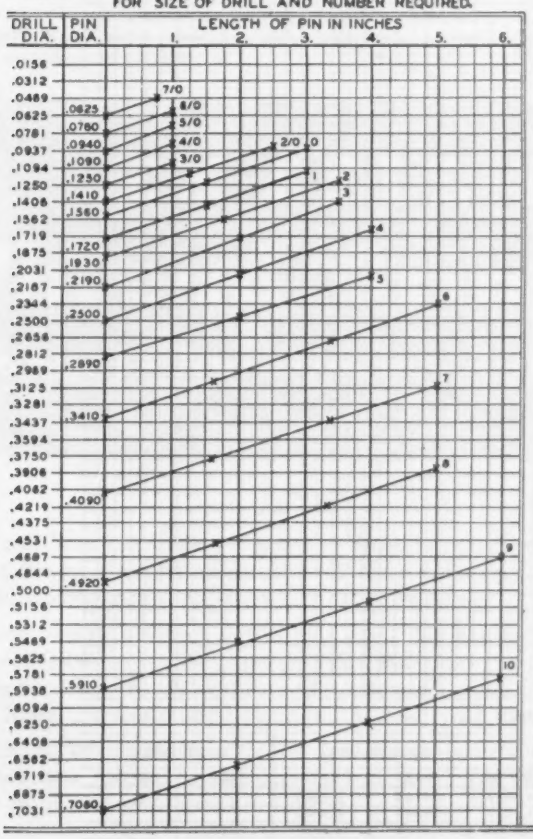
Appendix

DRILLING SPECIFICATIONS FOR TAPER PINS



EXAMPLE — NO. 10 x 6" TAPER PIN USING 3 DRILLS FOR STEP DRILLING AND STRAIGHT FLUTED REAMERS

NOTE — SEE DRILL CHART AT BOTTOM OF PAGE FOR SIZE OF DRILL AND NUMBER REQUIRED.



TO OBTAIN DRILL SIZES

DETERMINE DEPTH OF HOLE (PIN LENGTH)

DETERMINE INTERSECTION OF DEPTH LINE WITH TAPER LINE

DRILL DIAMETER WILL BE THE NEXT SMALLER DIAMETER ON THE HORIZONTAL LINE ABOVE THE INTERSECTION.

NOTE THE NUMBER OF DRILLS RECOMENDED FOR MAXIMUM LENGTH

IF CHART CALLS FOR 3 DRILLS, DIVIDE THE DRILLING DEPTH INTO 3 EQUAL SPACES (NEAREST 1/4 INCH). IF PIN INDICATES 2 DRILLS, DIVIDE THE DRILLING DEPTH INTO 2 SPACES

EXAMPLE A

#10 PIN – 6" LONG
USE 3 DRILLS
.5781 DRILL THROUGH
.6094 DRILL 4" DEEP
.6562 DRILL 2" DEEP

EXAMPLE B

#10 PIN – 4" LONG
USE 2 DRILLS
.6094 DRILL THROUGH
.6562 DRILL 2" DEEP

ALL DETAIL DRAWINGS USING TAPER PINS SHOULD CARRY THE ABOVE TYPE OF NOTE AS INDICATED IN (A) OR (B).

TO OBTAIN THE DIAMETER AT THE SMALL END MULTIPLY THE LENGTH BY 0.02083 AND SUBTRACT FROM THE LARGE DIAMETER.

DRILL CHART

SIZE PIN	1ST. DRILL THROUGH SIZE	SECOND DRILL		THIRD DRILL	
		SIZE	DEPTH	SIZE	DEPTH
7/0	.0469				
6/0	.0469				
5/0	.0625				
4/0	.0781				
3/0	.0938				
2/0	.0938	.1094	1-1/4		
0	.0938	.1250	1-1/2		
1	.1094	.1406	1-1/2		
2	.1094	.1406	1-3/4		
3	.1406	.1719	1-3/4		
4	.1719	.2031	1-3/4		
5	.1875	.2344	2-		
6	.2344	.2656	3-1/4	.2969	1-3/4
7	.2969	.3281	3-1/4	.3750	1-5/8
8	.3906	.4219	3-1/4	.4531	1-5/8
9	.4688	.5000	4-	.5469	2-
10	.5781	.6094	4-	.6562	2-

If helically fluted taper reamers are used instead of step drilling and straight fluted reamers, the diameter at the small end of the pin is the size for the through drill.

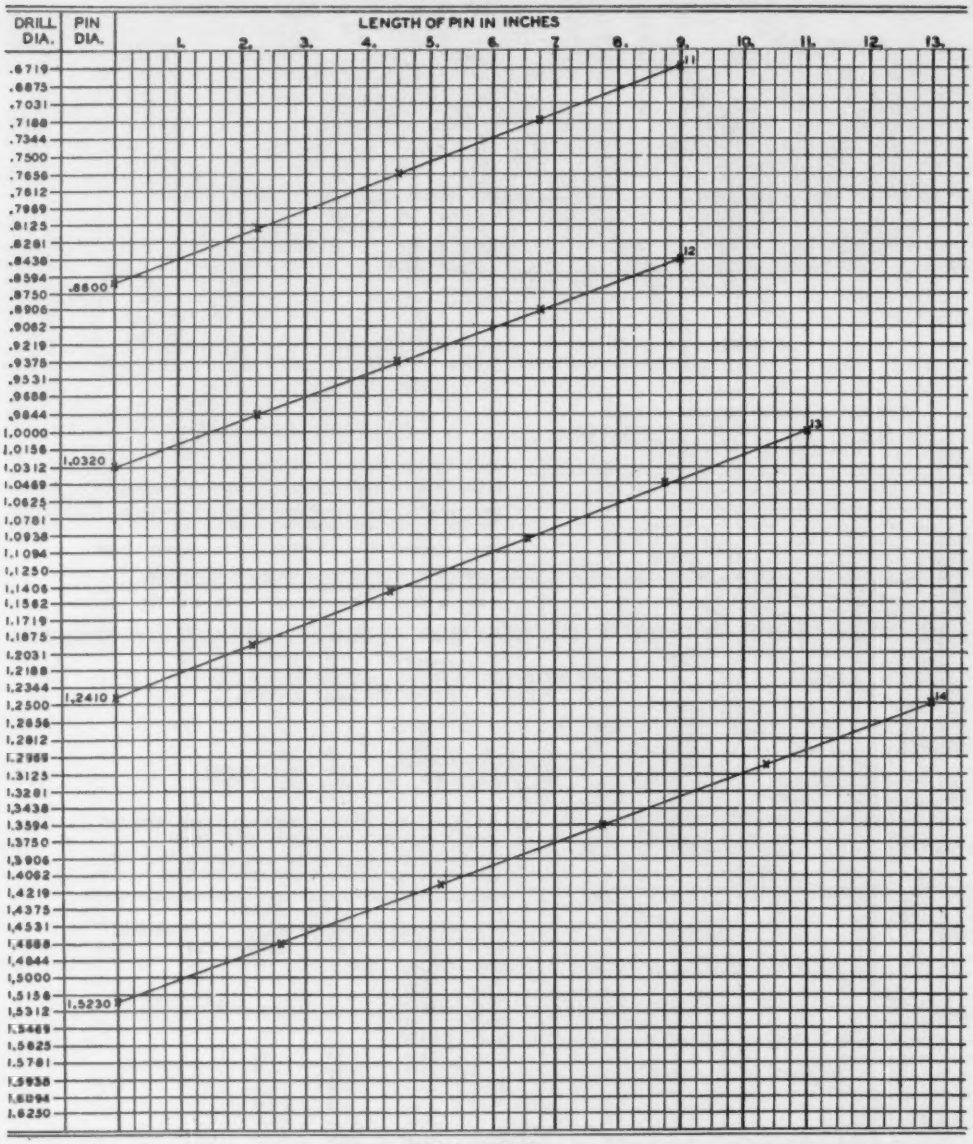
Extracted from ASA B5.20-1954 with permission of publisher, American Society of Mechanical Engineers

AMERICAN STANDARD MACHINE PINS—7

Appendix *(Continued)*

DRILLING SPECIFICATIONS FOR TAPER PINS CONT'D.

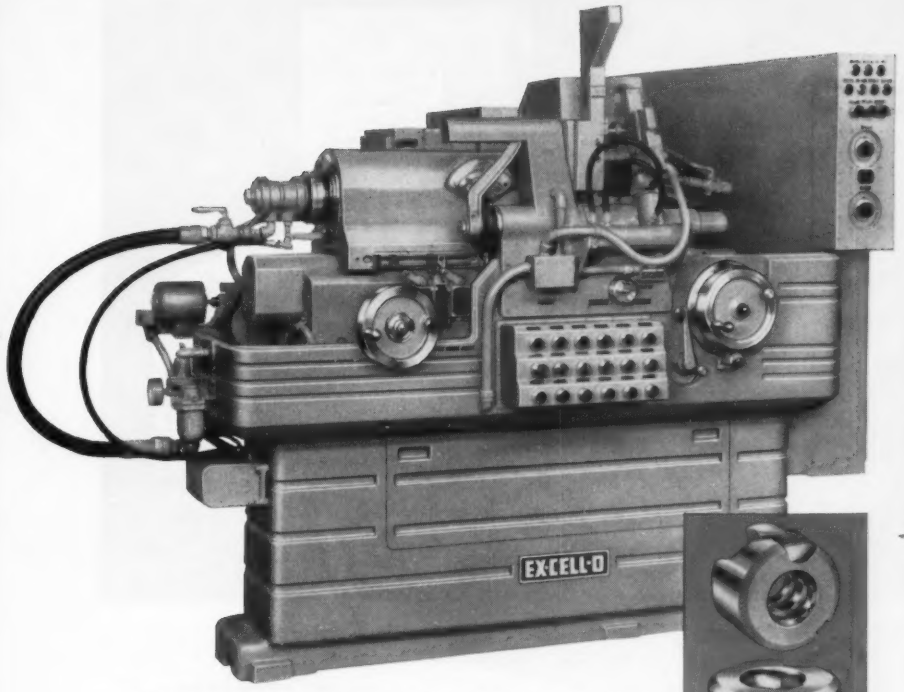
NOTE — SEE DRILL CHART AT BOTTOM OF PAGE FOR SIZE OF DRILL AND NUMBER REQUIRED



DRILL CHART

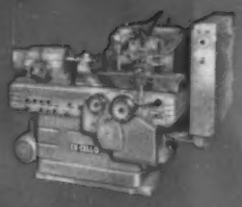
PIN SIZE	FIRST DRILL THROUGH	SECOND DRILL		THIRD DRILL		FOURTH DRILL		FIFTH DRILL	
	SIZE	SIZE	DEPTH	SIZE	DEPTH	SIZE	DEPTH	SIZE	DEPTH
11	.6719	.7188	6.7500	.7656	4.5000	.8125	2.2500		
12	.8438	.8906	6.7500	.9375	4.5000	.9844	2.2500		
13	1.0000	1.0469	8.7500	1.0938	6.7500	1.1406	4.5000	1.1875	2.2500
14	1.2500	1.2969	10.5000	1.3594	7.7500	1.4062	5.2500	1.4688	2.7500

Extracted from ASA B5.20-1954 with permission of publisher, American Society of Mechanical Engineers

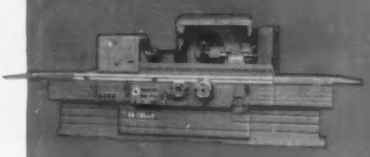


Ex-Cell-O Style 39-A Precision Internal Thread Grinder equipped with automatic work handling equipment. This machine loads, locates, grinds threads and ejects steering gear ball nuts in a completely automatic cycle.

EX-CELL-O
Thread Grinders
Manual – Automatic – Automated



EX-CELL-O STYLE 33 FOR EXTERNAL THREADS: An accurate production machine, automatic except for loading, unloading, and moving the cycle lever. Can be arranged for tapered grinding and for eccentric relief grinding.



EX-CELL-O STYLE 36 FOR LONG EXTERNAL THREADS, also available with internal attachment. A high production machine with easily adjusted work cycles.

EX-CELL-O STYLE 50: A versatile machine for external work . . . also available with internal attachment.

EX-CELL-O STYLE 120: Our largest Thread Grinder. Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.

These standard machines are grinding thread gages, machine tool lead screws, innumerable aircraft parts, automotive steering mechanisms and pinions, worms, taps, and many similar workpieces.

Precision thread grinders in this Ex-Cell-O line range from manually-operated models, for toolroom and for short runs, to high production automatics, to styles equipped with automatic work handling equipment. There are five models designed to meet your every requirement.

For specific information on thread grinder operations or a quotation on a machine for your requirements, call your local Ex-Cell-O representative or write Ex-Cell-O in Detroit.

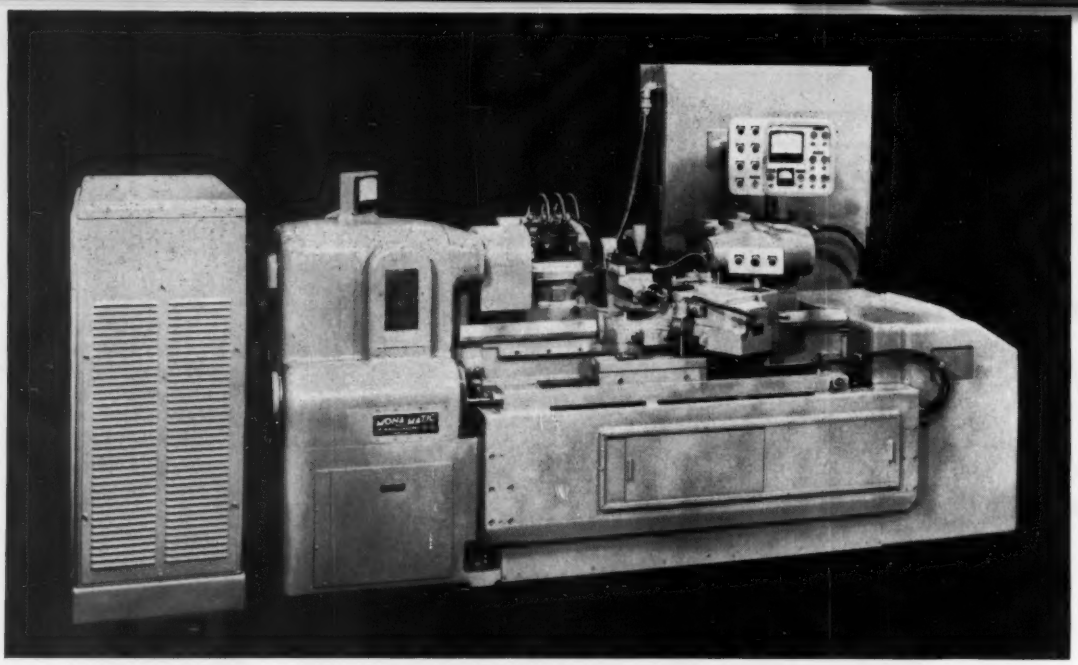
EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-5

XLO



Model 21 Mona-Matic manufacturing lathe equipped with constant surface-cutting speed mechanism offered by the Monarch Machine Tool Co.

Constant Surface-Cutting Speed Mechanism for Monarch Lathe

A constant surface-cutting speed mechanism for the recently announced Model 21 Mona-Matic manufacturing lathe is now offered by the Monarch Machine Tool Co., Sidney, Ohio. Functioning in conjunction with the Multicycle Programmer that controls the four-cut fully automatic work cycle of the lathe, the mechanism provides automatic variation of the drive-motor speed to maintain the desired surface-cutting speed on each of the various diameters and contours of the work-piece. This is said to give greatly increased tool life, higher rates of production, and improved finishes.

During operation, the Multicycle Programmer of the lathe indexes from one cutting cycle to the next, causing the cutting tool to be automatically positioned for the required cut. An electrical signal indicating the exact distance from the cutting-tool tip to the work-piece center line is transmitted to the constant surface-cutting speed mechanism. This mechanism then automatically adjusts the drive-motor speed and, as a result, the spindle speed to produce the desired surface-cuting speed on the work-piece. If, during the actual cut, the drive motor deviates from the proper speed, a special feed-back signal system enables the constant surface-speed control to compensate for the error.

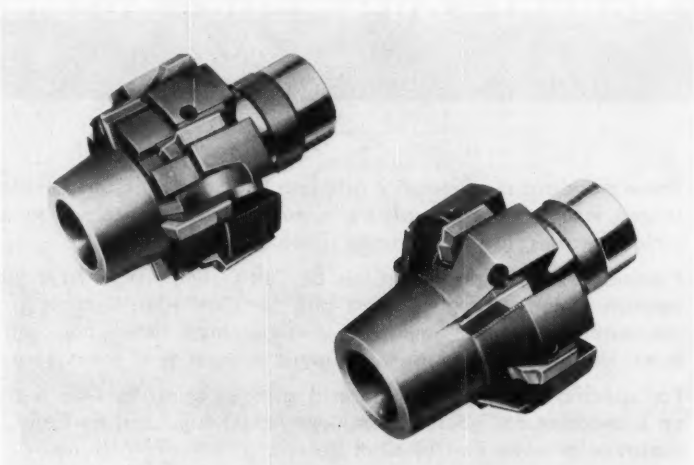
When contours are turned under control of the "Air Gage Tracer" unit of the Model 21 lathe, the mechanism continually varies the drive-motor speed to automatically maintain the required surface speed at the point the tool tip is actually cutting.

The electrical control equipment of the mechanism is housed in a separate cabinet near the driving-motor end of the machine. The main drive of the Model 21 Mona-Matic is an alternating-current, 25-H.P. variable-speed motor. Available surface speeds range from 200 to 1175 feet per minute and can be maintained over a 4 to 1 diameter range.

Circle Item 151 on postcard, page 257

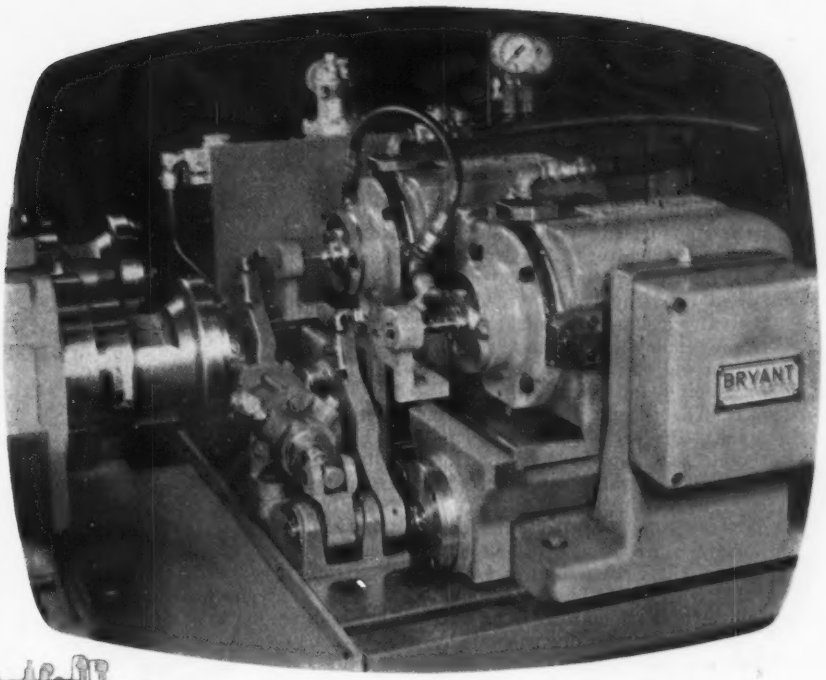
Inserted-Blade Tools for Machining Valve Seats

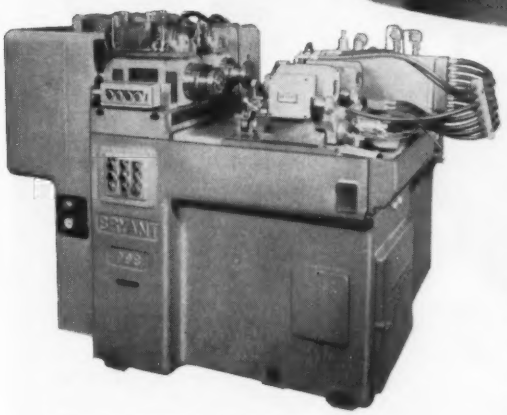
Special multiple-cutting tools, designed by Continental Tool Works Division, Ex-Cell-O Corporation, Detroit, Mich., are said to be making important savings in the costs of machining heavy-duty Diesel engine cylinder heads.



(Left) Inserted-blade tool for semi-finishing, boring and cutting radius for exhaust valve seat. (Right) Finish-chamfering cutter for intake valve seat designed by Continental Tool Works Division, Ex-Cell-O Corporation

Burring bearing bores...

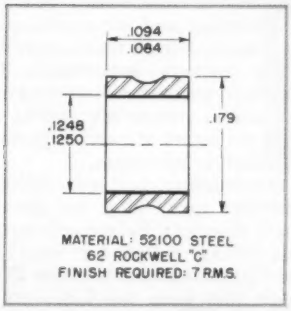




for greater accuracy and increased production

A manufacturer of extremely small ball bearings recently found that tooling the Bryant 998 precision boring machine with Bryant's *new* series 800 hi-frequency wheelheads resulted in higher production and fewer rejects.

The bores of hardened inner races are finished using burs to a tolerance of .0002, removing .005 stock – production, 280 pieces per hour at 100%.



The Bryant 998 is mechanically operated by positive cam action that provides constant tool control. Its table moves on pre-loaded, anti-friction ball slide ways. The ways are large-diameter hardened and ground steel bars that hold the table to a true path regardless of load or loading direction.

New series 800 Bryant hi-frequency wheelheads supply smooth, trouble-free operation for the toughest burring and grinding jobs at speeds from 10,000 to 100,000 R.P.M.

Write today for complete information on the Bryant 998. Ask also for information on Bryant Series 800 hi-frequency wheelheads.

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These cutters have been designed to eliminate six separate operations formerly performed by single-purpose cutters. Additional savings are effected by adapting these tools to a standard radial drill press.

Following various initial operations performed with standard Continental cutters, the two special multiple-cutting tools illustrated are employed to machine the valve seats in the nickel cast-iron cylinder heads. The first tool roughs out the valve seat by boring, facing, and chamfering in one pass. The second multiple cutter finishes the valve seat and forms the clearance space. Openings for the exhaust valve are similarly machined with special Continental cutters. Stop collars on the toolholders control the depth of cut, and all the cutters used are provided with quick, hand-detachable Continental standard drives.

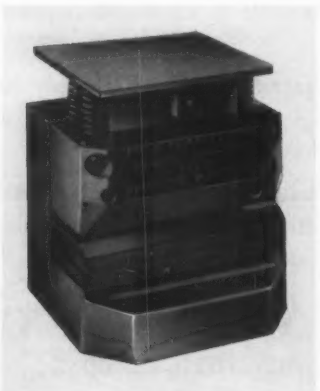
Multiple cuts at one pass of the tool are also performed at two other locations in the cylinder head—the air start check-valve hole and the spray valve hole. Machining of these latter openings includes rough, semi-finish, finish, and chamfer operations.

Circle Item 152 on postcard, page 257

Part-Numbering Equipment

A new line of "Unimark" part-numbering units has been announced by the Punch Products Corporation, Niagara Falls, N. Y. These units, with individual interchangeable numbers, emboss both part numbers and letters at the same time that hole-punching and notching operations are performed in the work-piece. They have the same shut heights and die heights as the manufacturer's "Unipunch" hole-punching and notching units and can be used in conjunction with any combination of perforating and notching set-ups on T-slotted plates, templates, or rails used in presses and press brakes. No aligning is necessary as the holder maintains accurate alignment on all operating parts.

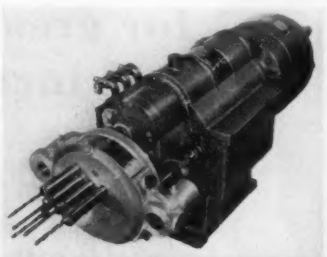
Circle Item 153 on postcard, page 257



One of a complete line of "Unimark" part-numbering units

Self-Contained Automatic Drill Unit

The Ettco-Emrick Model DU-2 automatic drill unit, available from the Ettco Tool Co., Inc., Brooklyn, N. Y., is a self-contained, high-speed device having a capacity for drilling holes ranging from wire sizes to 1/2 inch in steel. The machine cycle and the drilling depth are controlled by a sensitive electric relay system. A hydraulic system controls the rate of spindle feed and prevents overtravel at the bottom of the spindle stroke. Holes can be drilled accurately to any depth setting within the maximum stroke range of 3 inches. The rate of feed can be set from zero to the maximum rate the drill will stand. Air pressure, adjusted to suit drilling requirements, is used to feed the spindle forward and to return it to the starting position. The spindle is driven by either a motor or pulley and shaft.



Ettco-Emrick automatic drill unit

Features include rapid approach and retraction of the spindle and automatic return of the spindle in the event of power failure. A standard faceplate for either single- or multiple-spindle drilling is supplied with the unit. Units combined with multiple heads and electrically synchronized indexing fixtures can also be mounted on standard machine bases.

Circle Item 154 on postcard, page 257

Fig. 1. Fafnir pillow block unit with rubber-cushioned ball bearing

Fig. 2. Rubber cylindrical cartridge type ball bearing

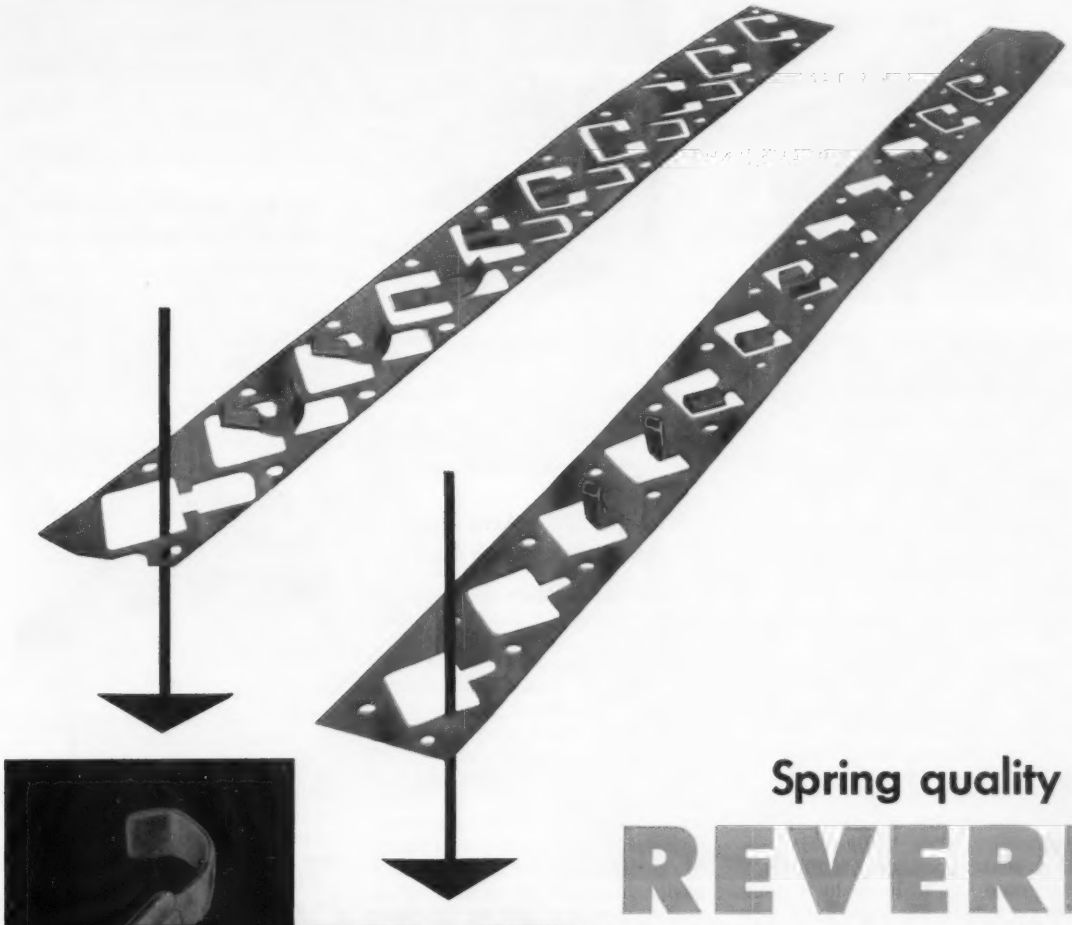
Fafnir Rubber-Cushioned Ball Bearings

The Fafnir Bearing Co., New Britain, Conn., is manufacturing a new line of rubber-cushioned ball bearing units, developed for super-quiet operation. This line is designed to replace ordinary sleeve bearings in home and commercial heating and air-conditioning equipment, where quiet operation is of primary importance. The specially processed ball bearings encased in rubber are said to reduce the sound of moving parts to an absolute minimum.

Outstanding features include: extended inner ring for greater shaft support; Fafnir-originated, self-locking collar for easy assembly; patented removable Plya-Seals that keep the lubricant in and contaminants out; and prelubrication with the correct amount of long-life, factory-filtered grease. The line includes pillow block units (RPB type), Fig. 1, and rubber cylindrical cartridges (RCR and RCSM types). The RCR type cartridge fits popular brackets using sleeve bearings.

Circle Item 155 on postcard, page 257

(This section continued on page 254)



Two types of Krueger and Hudepohl clips, and strips showing progressive stages in fabrication.

Spring quality of REVERE PHOSPHOR BRONZE makes solderless connections possible

It is not always the case that solder has to be used to make good electrical connections. Often phosphor bronze clips can be used, tightness being achieved through the hard-gripping spring quality of this metal. Take the clips made by Krueger and Hudepohl, Inc., Cincinnati 2, Ohio. This company uses Grade A 5% Revere Phosphor Bronze to make its connections for refrigerators, and for submersible pumps and hydraulic control units. Such services require not only tight permanent connections, but the ability to withstand severe temperature variations, as well as vibration. Revere Phosphor Bronze meets the needs perfectly. In developing this application, the Revere Technical Advisory Service collaborated closely with the customer on the important matter of temper required both for fabrication and end use. Krueger and Hudepohl report no rejects. The metal is supplied in the form of strip, one inch wide, and in very long coils, so that down time for coil set-up on each progressive die machine is minimized. Send for your free copy of "Revere Phosphor Bronze," which provides details about qualities, performance, and applications.

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"The Revere Four-Way Service" is a 16mm sound motion picture in color, interesting and informative. If you would like to see it, write nearest Revere Sales Office.

For more information fill in page number on Inquiry Card, on page 257

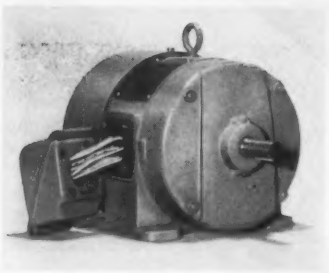


Fig. 1. "Standard Enclosed" motor

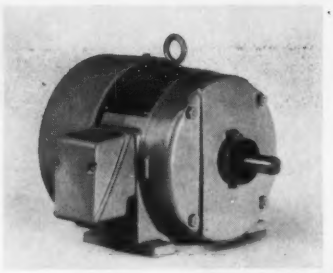


Fig. 2. G-E "Severe Duty" motor

G-E Standard and Severe Duty Motors

Two lines of enclosed, non-ventilated, alternating-current, fan-cooled motors in the 1- to 5-H.P. range have been announced by the Small Integral Motor Department of the General Electric Co., Fort Wayne, Ind. These new lines, designated "Standard Enclosed" and "Severe Duty Enclosed," replace a line of 1- to 5-H.P. motors.

The "Standard Enclosed" motor, Fig. 1, features a steel conduit box and fan cover. "Keyhole" mounting provides for quick, easy installation of the conduit box. A 1/2-inch conduit hole with a 3/4-inch knock-out is provided for versatility. The conduit box is completely gasketed with cork neoprene. Both lines have long perma-numbered leads for use with time-saving wire nuts. All enclosed, foot-mounted motors are now equipped with a lifting eye.

The "Severe Duty" motor, see Fig. 2, is basically the same as the standard motor except for certain features which make it suitable for use in corrosive or excessively moist atmospheres. A stainless-steel kit is available for use in severe corrosive atmospheres.

Circle Item 156 on postcard, page 257

Greaves Over-Arm Brace and Swivel Base Vise

The Greaves Machine Tool Division, J. A. Fay & Egan Co., Cincinnati, Ohio, is manufacturing a heavy-duty over-arm brace, Fig. 1, designed for mounting on the Greaves horizontal milling machine. This brace provides extra arbor support for heavy slab milling or extra-heavy cuts and for maximum precision on close-tolerance milling. It is completely adjustable within the travel limits of the machine, and is quickly and easily attached by means of a single clamping bolt on the knee and two bolts on the arbor support. The brace provides rigidity by tying the over-arm to the knee.

The heavy-duty swivel base vise, Fig. 2, may be used for holding all types of small work-pieces. The unit, made of semi-steel castings, is exceptionally low in height, giving maximum vertical clearance. The vise base is graduated through 180 degrees from a master index-plate for angle milling in a horizontal plane.

Circle Item 157 on postcard, page 257

Fig. 1. Heavy-duty over-arm brace designed for Greaves horizontal milling machine

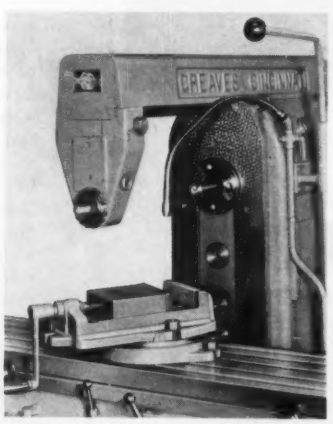
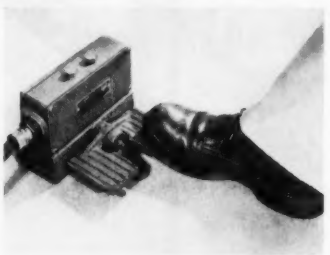


Fig. 2. Greaves heavy-duty swivel base vise with 180-degree graduated base

DoALL Foot-Control for Metal-Cutting Band Saw

A foot-control for band machines equipped with hydraulic table feed has been announced by The DoALL Co., Des Plaines, Ill. This control is designed to facilitate production sawing, slotting, notching, shaping, and parting



Foot-control for DoALL band saw

operations. It eliminates hand manipulation of the feed and speed controls and facilitates more efficient straight or contour production sawing.

The control provides a means for effortless operation of the forward or return stroke of the hydraulic table and also permits the table to be stopped at any point in its travel. Operated in conjunction with a switch on the instrument panel of the band machine, the pedal control can be made inoperative or it can provide two different types of table operation—straight sawing and contour sawing. When the panel switch is set for straight sawing, a touch of the toe on one foot-control starts forward or feed motion at a rate and pressure which have been pre-set on the instrument panel. The return stroke, obtained by depressing the opposite pedal, is at full speed. With this arrangement, the operator loads a part on the table and latches the foot-control in forward position to make the cut. A touch of the toe to throw the control in reverse position returns the table at full speed, at which time the completed part is removed with one hand and an uncut part dropped into the fixture with the other.

Circle Item 158 on postcard, page 257

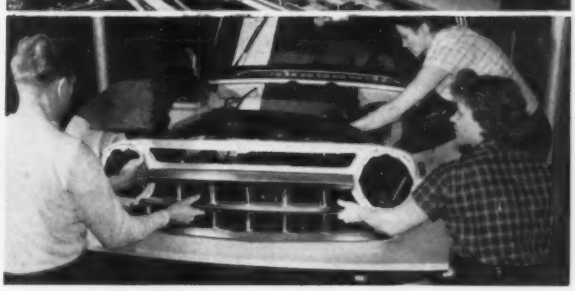
(This section continued on page 262)

NUMBER 1 OF A SERIES

PRODUCTION SHORT CUTS WITH

ZINC

DIE CASTINGS



The RAMBLER puts on its best front!

The completely new 1956 Rambler—by American Motors—features a unique front end assembly styled to endow this compact, economical car with a massive, forward-thrusting look. And this assembly graphically illustrates why ZINC Die Castings are so widely specified by design engineers in and out of the automotive industry.

As you see, the ZINC Die Cast grille is attached to a sheet metal frame before mounting on the car. The grille top molding and the inboard headlamp bezels are then attached to cover the frame and complete the front end. Because such unusual shapes can be die cast, only four castings are required in the assembly (plus the two running-light bezels in the fenders).

Send for your copy

The Rambler front end assembly is further simplified by casting the steel mounting bolts as inserts in the back of both the grille and the molding. These precisely located fastening elements, plus the overall dimensional accuracy of the castings, assure perfect fits every time. Add easy finishability (all of the castings are beautifully chromium plated) and you have the principal reasons why ZINC Die Castings are specified by American Motors engineers.

For possible answers to *your* particular production problems, send for our brochure and contact any commercial die casting company.

The New Jersey Zinc Company, 160 Front St., New York 38, N. Y.

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FOR DIE CASTING ALLOYS

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R B & W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

The important facts about nuts

A nut's purpose is to load the bolt in tension for a tight joint. For this, it is given shear strength greater than the breaking point of the bolt; and sufficient bearing area to avoid crushing or flow of the bearing surface with consequent reduction of tension.

While the thread form of a nut is accurate, its "lead" cannot, for practical purposes, be made identical with that of the bolt. Thus, a nut is made from material plastic enough to allow the threads to deform upon tightening and thereby adjust to distribute the load over many threads rather than concentrate it on the first few.

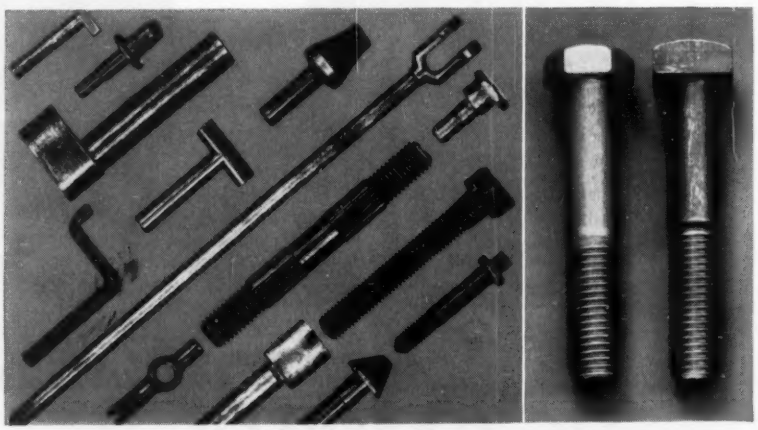
WHAT TO USE

The standard "Finished" nut series satisfies the requirements. It gives not only the required bearing area, but also enough section for proper strength and to minimize the spreading or dilation of a nut when loaded. (The standard "Heavy" nut series is called for only when bolt holes have large clearances, or for high bolt loads.)

As a good general guide to follow, use nuts that are:

1. Made to Am. Std. dimensions;
2. Made from soft, ductile material;
3. Strong enough to break the bolt or screw with which it is used. This would determine whether "Finished" or "Heavy" series is selected.

Cold heading produces strong, low cost parts



Representative range of mechanical parts produced by RB&W by cold heading . . . the same process used to produce the high quality, economical RB&W standard bolts and cap screws shown at right.

Here's a product-improving fact often overlooked: The same forming operation that produces large volumes of strong fasteners at surprisingly low cost can also be used for headed, special mechanical parts.

Cold heading upsets metal along its own axis. Flow lines are continuous, without folds, giving greater head strength against shear, fatigue and impact. Moreover, the material has better quality to start with, since unsound metal would distort or open in the operation and be rejected automatically. Uniformity is assured. Finish is also better.

Designers and production men get all these physical advantages when using RB&W standard bolts and cap screws. They can also have them in special parts at low cost when the need is of sufficient volume to justify machine set-up time. For more information and help on your specific needs, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

30% faster assembly— and joints stay tight

When famous-make chain saws were fastened with regular screws plus washers, they loosened on the job. Then SPIN-LOCK screws were used. These not only held tight, they also speeded assembly time 30%. What's more, they cost no more than former screw plus lock washer.

SPIN-LOCK screws have self-anchors in the form of hardened, tiny teeth which dig in and hold under severe service. Various types, sizes and heads available. Send for data or see Sweet's Product Design File.

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NEW CATALOGUES

CEMENTED CARBIDES—Carboloy Department of General Electric Co., Detroit, Mich. 66-page catalogue GT-310 covering the most effective cutting speeds for carbide tools, machine tool horsepower requirements, how to determine shank size of single-point tools, carbide tool geometries, carbide grade selection, and other technical topics. Included is also price and specification information on standard brazed carbide tools, toolholders, standard carbide throw-away inserts, blanks for twist drills, dies, and guide bushings, balls, valve seats, and many other applications. The publication also summarizes Carboloy's customer training courses on carbide tools and dies. 1

TUBE WELDING—Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa. Folder TDC-162A contains information on the welding characteristics of both austenitic and ferritic types of stainless steels and briefly describes various welding methods and techniques. Also included is a table indicating electrodes, preheating and post-welding heat-treatments to be used in joining the stainless steels to each other and to carbon, carbon-molybdenum and chromium-molybdenum alloy steels by the arc-welding method. 2

LATHE WITH PUNCH-CARD CONTROL—Sundstrand Machine Tool Co., Rockford, Ill. Bulletin 14-1 describing the Model 14 multi-cycle single-point production lathe with automatic cycle for roughing and finishing with separate tools. One automatic cycle will incorporate three cuts on eight diameters at four different speeds—Bulletin 14P-1 describing application of a punch-card control system on the Model 14 lathe. This system reads a card that has been punched with the proper numerical dimensions and feeds electrical signals into the machine control unit. 3

PUNCHING DATA—Pivot Punch and Die Corporation, North Tonawanda, N. Y. 20-page booklet entitled "55 Perforating Problems and Their Solution." Illustrations of actual parts provided by punches, including many examples where stock thicknesses exceed punch diameters, are shown along with a description of the problem involved in each case, the solution, actual production facts, and costs. Practically every type of perforating problem is included. 4

TURRET PUNCH PRESS—Wiedemann Machine Co., Philadelphia, Pa. Bulletin No. 61 describing the R-61 heavy-duty turret punch press which combines in one machine: The speed of the punch press; the immediate availability of a variety of punches and dies in a turret; and a quick-setting mechanical work-positioning gage. This combination provides economies in the piercing of flat material in short run to medium-production quantities. 5

HAND TOOLS—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 78-B listing and illustrating nine new hand tools for sheet-metal work. They are three new compound leverage shears for straight, right, and left cuts, three new straight snips, and three new combination snips. Also described and illustrated are Niagara's bench shears, hammers, mallets, stakes, bench plates, rivet sets, groovers, hollow punches, bending machine, roofing folder, pipe crimper, roofing double seamer, and gutter beader. .6

PLASTIC LAMINATE—Garlock Packing Co., Palmyra, N. Y. Leaflet describing a new lining material that can be applied to tanks, pipes, and inexpensive containers. The material is a laminate of Kel-F plastic, fused and flowed into glass fiber cloth backing. Characteristics of the laminate include extreme chemical resistance to acids, alkalies, oxidants, and solvents; non-toxic; high abrasion resistance, tensile strength, dielectric strength, and electrical resistivity. ...7

DIE-CASTING MACHINE — Cleveland Automatic Machine Co., Cincinnati, Ohio. Bulletin 400-N describing the company's Model 400-N die-casting machine. This model, while similar to Model 400, has been increased in rigidity and hydraulic capacity. As a result, the machine is fast and can be furnished as either a cold chamber or hot chamber machine. The full 400-ton locking pressure has been strain-gage tested. 8

LIMIT SWITCHES—R. B. Denison Mfg. Co., Cleveland 13, Ohio. Loxswitch catalogue 955 containing complete purchasing and specification data on seven models and nineteen contact arrangements of Loxswitch heavy-duty limit switches. In addition to buying information, this catalogue also describes the main features of the switches. A large cut-away view illustrating these features, as well as an identification of parts, is shown. 9

PAINT STRIPPER—Oakite Products, Inc., New York City. Booklet entitled, "How to Strip Paint," describing the procedures followed in four different stripping methods—steam gun, hot flow-on,cold spray, and tank. It tells which materials to use for specific types of paint, enamel, and lacquer. The booklet also discusses ways to protect stripped parts from rust in storage and how to prepare them for repainting to prevent future rusting. ...10

METAL-WORKING EQUIPMENT — Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. 12-page booklet entitled "4 in 1" giving a comprehensive picture of the four basic lines of the company's metal-working machinery. The

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illustrated catalogue shows the various types of its mass-production equipment. No details are given on the particular machines, as the purpose of this booklet is to indicate the general scope of the company's products. 11

MINIATURIZATION—Standard Pressed Steel Co., Jenkintown, Pa. 20-page booklet describing the application of miniaturization to industrial and consumer product design. Illustrated with charts and photographs, the booklet shows the importance of precise laboratory information on physical strength and probable loads as a prerequisite to using the smallest possible part. 12

CEMENTED CARBIDES — Firth-Loach Metals, Inc., McKeesport, Pa. Catalogue describing the company's "Firlomet" line of cemented carbide blanks. Illustrated and described are all styles of standard blanks, as well as rectangular strips, pulley grooving and stone chisel blanks, and blanks for reamers, lathes, boring tools, roll turning and milling cutter blanks. 13

NICKEL PLATING—Hanson-Van Winkle-Munning Co., Matawan, N. J. 20-page booklet on bright nickel plating by the Nickel-Lume process. Three techniques for electro-depositing are described. Nickel-Lume Type I, for use in still tanks or with conveyors where work loads are in mild motion; Type II, for use with air agitation; and the Barrel process for plating in cylinders. 14

MAGNETIC CHUCKS—Taft-Peirce Mfg. Co., Woonsocket, R. I. Bulletin 412 covering the company's Superpower magnetic chucks and accessories. Standard lines of rectangular magnetic chucks, rotary magnetic chucks, sine-angle magnetic chucks, and magnetic work-drivers are described. Included under accessories are control switch equipment, demagnetizers, and magnetic parallels and V-blocks. 15

SPEED REDUCERS—Farrel-Birmingham Co., Inc., Ansonia, Conn. 52-page bulletin 450. This is a comprehensive, well-illustrated booklet which contains full information about the complete line of Farrel speed reducers. Included are horsepower rating tables, specifications, dimensions, weights, and other data needed for quick selection of speed reducers for various applications. 16

STAINLESS FASTENERS—Allmetal Screw Products Co., Inc., Garden City, N. Y. Stock list and data book of the Company's products. The 48-page well-illustrated book is divided into the following chapters: cap, machine, and self-tap screws; set, wood and miscellaneous screws; bolts and nuts; washers, rivets, pins, studs; and "AN" (Army-Navy) specification fasteners and pipe fittings. Complete ordering specifications are given. 17

AIR AND HYDRAULIC COMPONENTS—Rivett Lathe & Grinder, Inc., Boston, Mass. Folder describing the complete line of the company's valves, cylinders, and power units. Featured are cross-section views of cylinders and valves and data on both air and hydraulic models. Also illustrated are the seven-cylinder mounting styles and the numerous valve types of operation. 18

MAGNETIC SEPARATOR — Industrial Filtration Co., Lebanon, Ind. Technical sheet on Delpark's new principle of magnetic separation. The separator uses a flat magnetic field instead of the conventional drum used by magnetic separators. The liquid flow is on top of the magnets, and gravity action assists the magnets in attracting ferrous particles and sludge from the liquids. 19

ROD END BEARINGS—Fafnir Bearing Co., New Britain, Conn. Bulletin describing a new series of rod end control bearings for aircraft. The rod end bearings come in five sizes specifically designed so that bearing capacity, shank strength, and bolt strength are in balance. The series consists of standard sizes which meet a wide range of requirements for anti-friction rod ends. 20

HEAT-TREATMENT—Tubular Products Division, Babcock & Wilcox Co., Beaver Falls, Pa. Illustrated folder entitled, "Heat-Treatment of Air Hardening Alloys on Welding," furnishing metallurgical data on the subject of postweld heat-treatment and the influence of weld preheating temperature on hardness and microstructure of heat-treated welds of air hardening alloys. 21

V-BELT DRIVES—Allis-Chalmers Mfg. Co., Milwaukee, Wis. 36-page pocket-size booklet 20E8297 containing the origin, history, and development of the modern multiple V-belt drive. The booklet also covers the evolution of standards in engineering V-belt drives, tells how to engineer a V-belt drive, provides tables and data, and describes modifications. 22

BUR SELECTOR CHART—Atrax Co., Newington, Conn. Wall chart 18 1/4 by 27 1/2 inches containing operating information and illustrations of more than 120 standard Atrax solid tungsten-carbide burs. The complete line of the company's burs is depicted at actual size with specifications and tool principles to facilitate ordering. 23

FILTERS—Cuno Engineering Corporation, Meriden, Conn. Catalogue SAK-057 describing the company's all-metal edge type liquid filter, Super Auto-Klean, that stops micronic particles and is cleanable without interrupting flow. This filter has been designed specifically for lube, fuel, and hydraulic liquids on Diesels, machine tools, and special machinery. 24

IMAGE INTENSIFIER—Research & Control Instruments Division, North American Philips Co., Inc., Mount Vernon, N. Y. Bulletin giving engineering data on industrial applications of a Norelco industrial image intensifier. The text deals with fluoroscopic X-ray examination of steel and other materials with high-density and absorption characteristics. 25

GEAR HOBBERS—Hamilton Tool Co., Hamilton, Ohio. Bulletin GH 53 describing the company's No. 00 gear hobber, a machine of extreme precision used in the hobbing of small precision spur gears, pinions, and special tooth forms for watches, clocks, business machines, instruments, and other products that demand precision. 26

VIBRATION AND NOISE CONTROL—Korfund Co., Inc., New York City. Illustrated catalogue K6A entitled "The Plant Engineers' Guide to Machinery Mounting, Vibration & Noise Control" discusses such problems as machine mobility, eliminating floor bolts, leveling machines, eliminating rejects, and controlling vibration and noise. 27

CYLINDERS—Oilgear Co., Milwaukee, Wis. Bulletin 79000 containing comprehensive information regarding design and

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1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42
43 44 45 46 47 48 49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 64 65 66 67 68 69

NEW SHOP EQUIPMENT

101 102 103 104 105 106 107 108 109 110 111 112 113 114
113 116 117 118 119 120 121 122 123 124 125 126 127 128
129 130 131 132 133 134 135 136 137 138 139 140 141 142
143 144 145 146 147 148 149 150 151 152 153 154 155 156
157 158 159 160 161 162 163 164 165 166 167 168 169 170

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Page ..... Advertiser .....
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materials used in the manufacture of Oilgear custom-built cylinders. Available for 1500 psi, 3500 psi, or higher pressures, the heavy-duty cylinders illustrated cover a variety of special applications. 28

MECHANICAL TUBING—Tubular Products Division of Babcock & Wilcox Co., Beaver Falls, Pa. 4-page folder telling how—in a number of case histories—the company's electric-resistance-welded carbon-steel mechanical tubing solved engineering problems and simplified production and reduced cost. 29

SURFACE MEASUREMENT—Micrometrical Mfg. Co., Ann Arbor, Mich. 8-page illustrated technical bulletin containing information on ASA Standard B46.1-1955 on surface roughness, waviness, and lay, plus considerable supplementary material arranged for easy reading and convenient reference. 30

CUTTING TOOLS—Chicago Latrobe, Chicago, Ill. 52-page catalogue No. 55 showing the company's complete line of tools with prices and all dimensions. Catalogue contains technical data on tools made of high-speed, carbon steel and carbide—for use in steel, wood, concrete, and glass. 31

SPEED REDUCERS—Reliance Electric & Engineering Co., Cleveland, Ohio. 8-page bulletin E-2408 "Reduced Speed" describes the new line of Reliance gearmotors—the first line of gearmotors available incorporating the new NEMA motors and completely redesigned gear heads. 32

VARIABLE-SPEED TRANSMISSION — Speed Control Division, Fairchild Engine & Airplane Corporation, St. Augustine, Fla. Bulletin 130-A giving description and illustrations of the company's variable-speed transmission with an infinitely wide speed range. 33

COLLET SELECTION GUIDE—Hardinge Brothers, Inc., Elmira, N. Y. 4-page bulletin 56 containing specification and dimension charts, conversion and interchangeability listings, and prices. Information on collets for nose type collet chucks is also given. 34

DIVIDING HEADS — Cincinnati Milling Machine Co., Cincinnati, Ohio. Folder describing the company's 10-inch, 12-inch, and 14-inch dividing heads designed to increase the flexibility and adaptability of Cincinnati knee and column milling machines. 35

HEAT-TREATING FACILITIES — Selas Corporation of America, Dresher, Pa. Illustrated brochure describing the company's new plant. Detailed information is given on the equipment made by the company, and heat-treating processes are described. 36

VERTICAL CHUCKING MACHINE—National Acme Co., Cleveland, Ohio. Folder describing the company's Acme-Ryder vertical chucking machine equipped with actuating and control system using electrical, hydraulic, and mechanical interlocks for safety. 37

DRILLING MACHINE—Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Catalogue D-142 describes the 21-inch, stationary head, floor drilling machine. Features such as electrical controls, three-way feed, and the method of easily making speed changes are illustrated. 38

METAL-WORKING MACHINES—Famco Machine Co., Kenosha, Wis. General catalogue describes complete line of company's metal-working machines. Included are data and specifications on power presses, arbor presses, drill presses, band saws, and squaring shears. 39

CLUTCHES—Formsprag Co., Van Dyke, Mich. 8-page folder 103-C describing the company's standard clutches and clutch coupling units. Included are cutaway photographs, cross-section drawings, application suggestions, and engineering data. 40

GRINDING MACHINE — Gardner Machine Co., Beloit, Wis. Bulletin briefly describes and illustrates features of the 2V18 grinding machine which will give high production, dependable operation, and uniform work output at low cost. 41

HYDRAULIC PRESSES — Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 3201 giving detailed descriptions and illustrations of the company's broad range of hydraulic presses in the metal-working industry. 42

INVESTMENT CASTING—Arwood Precision Casting Corporation, New York City. 4-page folder detailing nine different applications of the investment casting process to products in as many different industries. 43

BERYLLIUM COPPER DIES—Beryllium Corporation, Reading, Pa. Brochure covering the following subjects: plastic molds and dies, forging dies, steel forming and draw dies, and titanium dies 44

AIR CYLINDERS—Petch Mfg. Co., Detroit, Mich. 12-page catalogue describes heavy-duty air cylinders designed to J.I.C. standards. Complete engineering drawings and specifications are included for five interchangeable mountings. ..45

V-BELTS—B. F. Goodrich Co., Industrial Products Division, Akron, Ohio. 14-page manual on the care and maintenance of industrial V-belts. Topics covered include designing drives, installing belts, and drive alignment. 46

GRINDING WHEEL FORMULATION—Bay State Abrasive Products Co., West-

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boro, Mass. Booklet describing a system that uses electronic computation to control the formulation of grinding wheels. 47

GRANITE SURFACE PLATES—Bryant Chucking Grinder Co., Springfield, Vt. Catalogue describing surface plates for lay-out, inspection, and assembly work made of "true" granite. 48

ELECTRIC MOTORS—Louis Allis Co., Milwaukee, Wis. Bulletin 1700 describes open dripproof and enclosed explosion-proof electric motors. Also described are special motors for various industrial requirements. 49

PRODUCTION FACILITIES—Portage Machine Co., Akron, Ohio. Elaborate 34-page booklet describing facilities for designing and building special machine tools. Various types of equipment in the shop are listed. 50

CARBIDE GRADES—Adamas Corporation, Kenilworth, N. J. 4-page booklet descriptive of this company's complete line of tungsten-carbide grades, including physical and chemical data for each grade 51

PORTABLE FILER—Nord Corporation, Nutley, N. J. Bulletin describes the Reciprofiler, a portable electric tool for die filing. Attachments for the tool and various applications are illustrated 52

LEVELERS—E. W. Bliss Co., Canton, Ohio. Bulletin 41 describes Voss levelers of both the inverted and chain types. The levelers will flatten all metal thickness from fine-gage strip to armor plate. ..53

MILLING MACHINE—Sundstrand Machine Tool Co., Rockford, Ill. Bulletin C1-1 describing the C1 Rigidmil, a milling machine of 5-H.P. capacity with infinitely variable feed rate. 54

BORING AND MILLING MACHINE—Marac Machinery Corporation, Yonkers, N. Y. Catalogue describing the Schwartzkopff KBF2 precision self-locating boring and milling machine. 55

TOOL SHARPENER—Firth Sterling Inc., Pittsburgh, Pa. Bulletin on Method X tool sharpener detailing selling points, specifications, and case histories. 56

CUTTING TOOLS—M. A. Ford Mfg. Co., Inc., Davenport, Iowa. 12-page catalogue No. 601 giving information on the company's complete line of cutting tools. 57

SQUARING SHEARS—Wysong & Miles Co., Greensboro, N. C. Catalogues GS-108 and AF-109 describing and illustrating the company's squaring shears. 58

BALL BEARINGS—Fafnir Bearing Co., New Britain, Conn. Folder on ball bearings and rubber-cushioned ball bearing units. 59

SELF - TAPPING INSERTS — Groov-Pin Corporation, Ridgefield, N. J. Booklet describing the Tap-Lok insert and its uses. 60

LIMIT SWITCH—Arch Instrument Co., Inc., North Quincy, Mass. Leaflet describing the company's electrical-mechanical limit switch. 61

THREAD-ROLLING MACHINES—Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. 12-page booklet No. 931-A-2 covering the complete line of the company's hand feed threaders. The machines illustrated and discussed are the reciprocating type, using conventional flat dies, and are designed to roll greater lengths of threads than automatic thread-rolling machines 62

STAINLESS STEELS—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. 10-page booklet entitled "The Chromium-Nickel-Manganese Austenitic Stainless Steels." Part of the AL Technical Studies series giving detailed information on stainless steels that use less nickel than the 300 series, yet give high performance in many applications 63

MULTI-ROLL CRADLES — U. S. Tool Company Inc., Ampere, N. J. Bulletin No. 95 illustrating and describing the company's multi-roll cradles, which are now made in two sizes, Model ACC-1-9-C for material up to 9 inches in width and Model ACC-1648 for material up to 16 inches in width. 64

CYLINDERS — Tomkins-Johnson Co., Jackson, Mich. 6-page bulletin containing data on the new line of T-J "Spacemaker" cylinders. This bulletin gives mounting dimensions and specifications on eight standard styles. 65

VARIABLE-SPEED DRIVE—Speed Control Division, Fairchild Engine & Airplane Corporation, St. Augustine, Fla. Bulletin 120-B describing the company's SPECON variable-speed drive with infinitely wide speed range. 66

LATHE FIXTURE—Universal Vise & Tool Co., Parma, Mich. 4-page catalogue No. LF56 describing the company's adjustable precision lathe fixture. Included are complete specifications and prices ...67

THREADING AND CHUCKING MACHINES—James Coulter Machine Co., Bridgeport, Conn. Completely revised catalogue describing the company's automatic threading and chucking machines. 68

BENDING ROLLS — Wysong & Miles Co., Greensboro, N. C. Catalogue R-106 describing the company's line of bending rolls. 69

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1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	

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101	102	103	104	105	106	107	108	109	110	111	112	113	114
115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142
143	144	145	146	147	148	149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164	165	166	167	168	169	170

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29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	

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101	102	103	104	105	106	107	108	109	110	111	112	113	114
115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142
143	144	145	146	147	148	149	150	151	152	153	154	155	156
157	158	159	160	161	162	163	164	165	166	167	168	169	170

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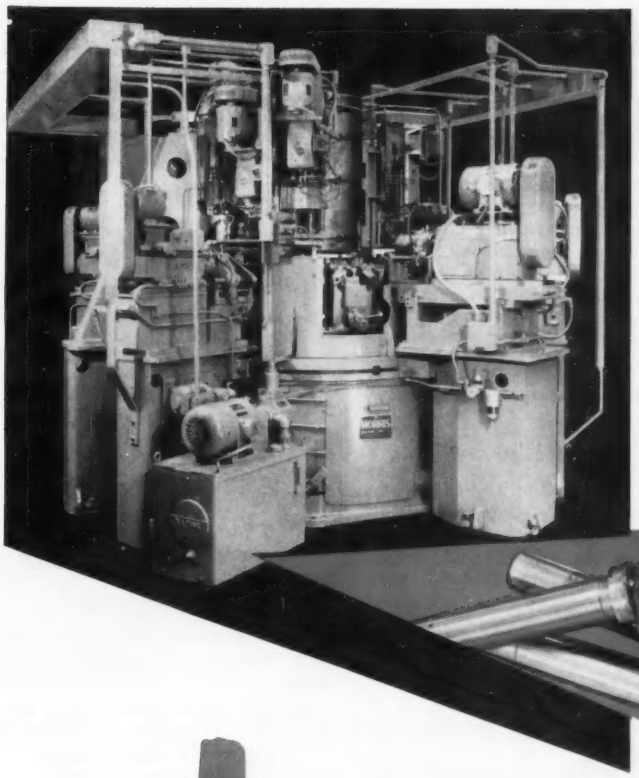

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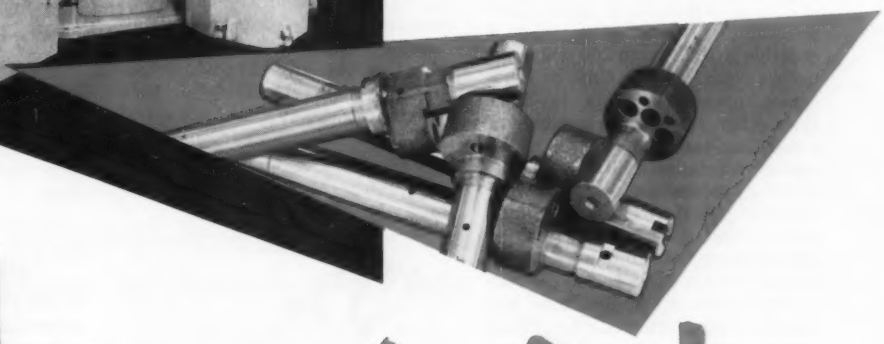
- MILLS 776 FLATS
- MILLS 776 SLOTS



Automatically!

This MORRIS Model 322-S High Production Machine produces 97 refrigeration compressor crankshafts per hour at 80% efficiency. In each part it automatically drills 11 holes, varying in diameter from .125″ to .375″. Six holes, including one hole 4¾″ deep, are drilled using gun drilling techniques. In addition, the machine mills one end slot and one chordal flat on the shaft.

These operations are coordinated through use of a MORRIS basic center column machine, equipped with a 48″ dia. table, a 12-station automatic indexing mechanism, and 16 MORRIS AIR-OIL-Matic and Cam-Matic Drill Units.

The result is a completely automatic "special" machine, designed using a standard basic machine and standard drill units . . . at a fraction of the usual special machine cost. The machine may be altered for model changes, without scrapping a complete machine.

Investigate the production-boosting and cost-saving advantages of MORRIS Unit-Type High Production Machine Tools. WRITE TODAY for detailed literature, or outline your production problem for analysis by MORRIS engineers.

See our insert in Sweet's Machine Tool File

Bullard MOR-SPEED Line

Morris

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Flame-Plated Paper Drills

Tubular paper drills with flame-plated outer surfaces used for drilling acoustical tile. The 0.002-inch thick coating of tungsten-carbide applied to these drills by the process service developed by Linde Air Products Co., a Division of Union Carbide and Carbon Corporation, New York City, makes it possible to drill up to 200,000 holes before replacement of the drill becomes necessary. This is more than fifty times the number of holes that can be produced by an unplated tubular drill. The flame-plating process can be used to coat finished parts with tungsten-carbide without distortion, as the temperature of the part being coated seldom exceeds 400 degrees F. For precision applications, the flame-plated coating can be ground and lapped by standard diamond-finishing methods.

Circle Item 159 on postcard, page 257

Electric Impact "SpeedWrench"

Universal electric impact wrench with 1/2-inch square drive announced by the Thor Power Tool Co., Aurora, Ill. This tool, designated No. 56 Thor "Speed-Wrench," replaces the Model 55 unit previously introduced and like the earlier model will have six hexagon sockets. It is designed for fast nut-setting and nut removal. With attachments it can also be used for drilling in steel, wood, stone, or other materials; as a screwdriver, and for tapping, driving, or removing studs. One-hand operation is possible through a finger-tip reverse button located in the handle behind the starting trigger. A molded rubber strain relief and anti-kink device is an important new feature. The tool is 9 5/8 inches long over-all, weighs 7 pounds, and has a 1 7/16-inch offset. It develops forward and reverse speeds of 1900 R.P.M. and delivers 1900 blows per minute.

Circle Item 160 on postcard, page 257

Nelco End-Mill

Spiral flute end-mill, designed to combine the advantages of a solid carbide cutter with the economy of a carbide-tipped tool, introduced by the Nelco Tool Co., Inc., Manchester, Conn. This true spiral flute end-mill embodies a sandwich-brazed, solid carbide insert correctly ground to precise tolerances. The true spiral design has been developed to reduce cutting pressures and to promote cooler, smoother operation with better finishes to closer tolerances. Available in two series—for steel and for non-ferrous metals—in standard sizes from 1/2 inch to 1 inch.

Circle Item 161 on postcard, page 257

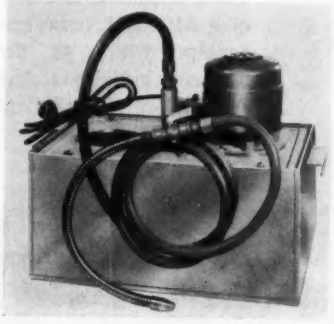
Niagara Metalworker's Snips and Shears

Three of the nine new sheet metalworker's snips and shears recently added to the line of hand tools manufactured by the Niagara Machine & Tool Works, Buffalo, N. Y. There are three compound leverage shears (for straight, right, and left cuts), three straight snips, and three combination snips. The compound leverage shears multiply hand pressure to provide exceptional cutting power with minimum effort. Eighteen-gage steel can be cut with ease. The drop-forged steel jaws have fifty-two serrations to the inch and are curved to divert the sheared metal. Pliable plastic hand grips have stop-posts to prevent hand slippage and to provide finger clearance.

Circle Item 162 on postcard, page 257

Sutton Coolant Pump

Model CTU-115 pump with rugged all-bronze pump housing, impeller, and shafts recently added to line of coolant pumps made by the Sutton Mfg. Corporation, Norfolk, Va. This unit will pump coolants, cutting oils, soluble compounds, and many other liquids to milling machines, lathes, presses, cut-off machines, belt sanders, grinders, or any other machines requiring copious quantities of liquid. The over-size motor is of the slow speed type designed for quiet operation and long life. This unit comes complete with 6 feet of flexible hose, 17-inch flexible nozzle with shut-off valve, and 8 feet of rubber cord with plug. A 5-gallon tank is regularly furnished.



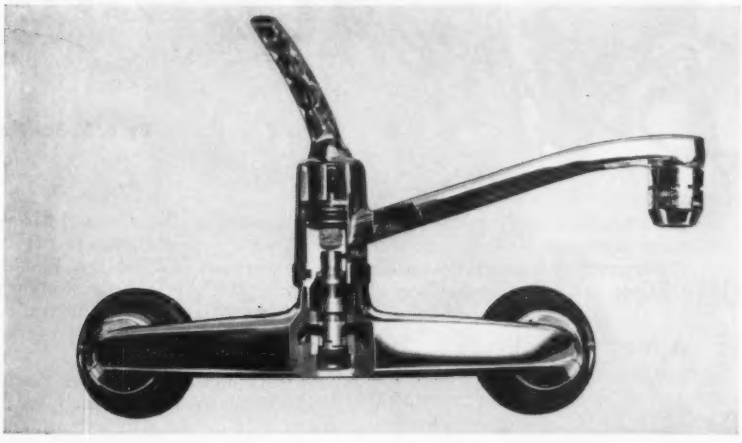
Circle Item 163 on postcard, page 257

BRIDGEPORT BRASS COMPANY

COPPER ALLOY BULLETIN

Bridgeport Brass Co.

Reporting new developments in copper-base alloys and metalworking methods.



Modern, Single-Handle Faucet Relies on Bridgeport Alloys for Precision-Fit Parts

A practical answer to scalded hands at the kitchen sink is the ingenious, precision Moen faucet made by Ravenna Metal Products Corporation, Seattle.

Replacing the traditional valve-and-washer system with a stem and ported-piston assembly, this faucet mixes hot and cold water to temperatures predetermined by the position of its single handle. Precision-fitted parts eliminate washers and assure watertight connections.

Recognizing that a simplified design often requires expert metallurgical and production knowledge to specify the proper materials, Ravenna asked Bridgeport Technical Service for assistance in materials selection.

This new faucet design placed double responsibility on the materials. All had to meet stringent machining requirements. Each finished part had extensive performance specifications. During test runs with conventional alloys, machining difficulties occurred. Then service failures developed, season-cracking among them.

Technical Service studies for Ravenna indicated that certain Bridgeport alloys, made to ASTM specifications with exact tempers and stress relief anneals, would meet all requirements. And, all machined parts could be made by straight machining on Ravenna's standard Warner & Swasey automatics.

For the spray, valve escutcheon and escutcheon nut, specifications stipulated the use of hard-temper Bridgeport Alloy T-64. Supplied in tube form, this high-leaded alloy is ideal for operations involving extensive machining.

For packing nut, spout end, brass body, body nuts, lock nut and jam nut, the specifications called for Ledrite 6 half-hard brass rod. This is a free-cutting alloy uniform in composition. It assures accurate dimensions and minimizes tool wear.

For spout tubing Bridgeport recommended light-drawn Alloy 69, a cartridge brass, highly ductile and well adapted to both cold-working and severe forming operations.

Radically different requirements were necessary for the anchor washer and discs. Here the studies recommended the use of Bridgeport F-3034 10% Phosphor Bronze D because its characteristics facilitated manufacturing and gave desired wear resistance.

In every instance, Ravenna has found that the alloy characteristics essential to manufacture also assure satisfactory service life in the finished product.

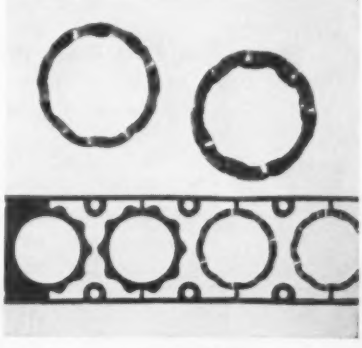
Whenever you plan to simplify or redesign your products, let Bridgeport Technical Service contribute its metallurgical studies and recommendations. This service, available from Bridgeport Sales Offices, can help you achieve manufacturing efficiency and product satisfaction.

Unique Ball Bearings Use Retainer Cages of Bridgeport Brass

Stephens-Adamson Manufacturing Company of Aurora, Illinois, produces the well-known Sealmaster ball bearing unit, widely used in mining, agriculture, textile and heavy-duty applications. Sealmaster bearings are designed to operate under severe atmospheric conditions with a minimum of maintenance.

Unique bearing cages accurately space the balls to distribute radial and thrust loads and at the same time trap and hold grease and prevent its churning. To make these retainer cages, Stephens-Adamson uses Bridgeport F-37 cartridge brass, soft, as recommended by Bridgeport Technical Service.

Smaller cages are made by progressive die operations. Larger cages are press-formed from blanked-out rings, the separate halves being riveted together.



Bridgeport Alloy F-37, developed primarily for the production of artillery shells and small arms cartridges, is a superior material for products which are deep-drawn, spun or progressively machined.

For Sealmaster bearings, Alloy F-37 is supplied in widths up to 9 inches. The easy working qualities of this Bridgeport alloy make it ideal for this application. In other cases, too, there is usually a preferable Bridgeport alloy. Technical Service can help you find it. A call to your nearest Bridgeport Sales Office will make all arrangements.

(4626)

Bridgeport Brass Co.

BRIDGEPORT BRASS COMPANY ♦ BRIDGEPORT, CONNECTICUT

Mills at Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich. Sales Offices in Principal Cities—Conveniently Located Warehouses

Between Grinds

By E. S. Salichs

The Nuts

In a certain foreign country, after a social call, the parting guest is provided with a bagful of pistachio nuts to munch on while homeward bound. A Chicago nut firm informed us of this and suggested that our readers might be interested in buying pistachio nuts to use as goodwill gifts. We have figured out that with your mouth full of nuts or shells you can't very well be critical of the time you've just had. And after you've finished the bagful, your jaws are too exhausted to make the effort.

From Baa, Baa, Black Sheep to Laa, Laa, Black Heap

Insulating "wool" made from Mt. Etna lava has been developed under a German patent to withstand greater heat than most glass fibers, according to the Armour Research Foundation. Our Government is studying it for possible jet plane application.

A Modern Beatitude

When the Editor recently visited Nevin L. Bean, technical assistant to the general manager of the Ford automatic transmission plant, he noticed the following saying tucked under the glass of Mr. Bean's desk: "Blessed are they who run around in circles, for they shall be known as wheels."

For Head and Hand

While some of MACHINERY'S staff returned from the Machine Tool Show in Chicago with such souvenirs as canes, red handkerchiefs, corncob pipes, ashtrays, and jumbo bottle openers, one enterprising editor brought back a headache pencil garnered from the service desk of the Wiedemann Machine Co., well-known manufacturer of piercing equipment. Around the barrel of the pencil was inscribed, "The Wiedemann Method Cures Piercing Headaches." The transparent top half of the pencil contained headache pills.

What Said That?

"Elevoice," a device on Otis automatic elevators, not only makes usual announcements ("Going up," "Out five, please") but also delivers special messages. For example, if a passenger is delaying the car's departure, Elevoice politely but firmly asks him to step aside and let the doors close. Now whoever would suggest "Late again?" as the message on the 9:05 car?

THERE'S LIGHT IN HER EYES—Mrs. Mary Stanford Hoskins metrologist and author of the excellent article entitled "Precision to a Fraction of a Light Wave," which appeared in March MACHINERY was prevailed upon to take just a little time out from her absorbing work at the Eli Whitney Metrology Laboratory and sit for this snapshot. The Laboratory was recently opened in Dayton, Ohio, by the Sheffield Corporation, well-known producer of scientific controls for automatic production. And lest there be any doubt that the realm of gage-blocks and interferometers is beyond feminine interest, here is a brief run-down of Mrs. Hoskins' experience in that field. After majoring in laboratory sciences at the University of Pennsylvania, she went to work for the Frankford Arsenal in Philadelphia during World War II, being employed there from 1942 to 1945 as a specialist in gage inspection for Army ordnance. For the next two years Mrs. Hoskins was in charge of the quality control laboratory of the Wilkening Piston Ring Mfg. Co., and in 1950 was back at the Arsenal, this time as supervisor of the Interferometry Section of the Army Gage Laboratory—a position she held until last July, when she joined the Sheffield Corporation. As they say, Mrs. Hoskins is one in how many million?

LEADING THE INDUSTRY IN DESIGN...

NO MARKING . . . NO SCRATCHING
NO UPSET EDGES . . .

THE Etna METHOD
FOR SMOOTH, WELL FORMED
STEEL TUBING

Closeup showing the Roll Cluster Unit Exclusive with ETNA Mills

Exclusive with Etna is the cluster unit. This unit progressively rolls the tube into shape without excessive stretching of the edges, thereby eliminating the "buckling" experienced with ordinary tube mills. Etna machines are not forming mills, they are designed for one purpose only . . . to make clear, well formed carbon and stainless steel tubing with no marking, no scratching, no upset edges. Write for complete details.

The ETNA 4KU Mill

Abbey ETNA Company

3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

For more information fill in page number on Inquiry Card, on page 257

News OF THE INDUSTRY

California and Colorado

F. B. TANNEHILL was appointed chief industrial engineer of Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif. Mr. Tannehill comes from the Automatic Electric Co., Chicago, where he has been supervisor of methods and engineering.

R. W. TITGEMEYER has been appointed assistant branch manager of the Los Angeles territory of the Carpenter Steel Co., Reading, Pa. He joined the company as sales engineer in 1947.

ZANE H. MARKLEY has been named sales representative for Kennametal Inc., Latrobe, Pa., in the Denver, Colo., area of the midwestern district. Mr. Markley was formerly associated with the F. J. Leonard Co. in Denver and was national sales manager for the manufacturing division of O. K. Rubber Inc.

Illinois

JOSEPH T. RYERSON & SON, INC., steel distributor, announce the following appointments at the Chicago, Ill., plant: SCOTT VROOMAN has been made assistant manager of sales. With the company since 1936, he has been manager of inside sales since 1954. DONALD E. WOODRUFF, former sales representative, assumes Mr. Vrooman's previous post. HARRY L. STURLA, JR. was made manager of the market research department. He was formerly assistant manager of that department. The following personnel changes were made at the Los Angeles plant: LOREN B. CLAY was appointed manager of tubular products and cold-finished bar sales; JOHN R. FENNIE was assigned to the sales district comprising Inglewood, Gardena, and Compton, Calif., areas. J. W. STEVENS has been added to the sales staff and will cover the Santa Monica, Culver City, West Los Angeles, and Beverly Hills, Calif., areas. At the New York plant, the following changes were made: JOHN J. HAUPTLY was appointed acting manager of the inside sales department. Succeeding him as manager of alloy-steel sales is RICHARD L. SMITH, formerly sales representative in Connecticut. EDWARD J. BYERS was appointed manager of tubular products and cold-finished bar sales, succeeding HENRY B. WILLIAMS. ROBERT F. PHILPOTT was appointed sales representative for the Ryertex-Glyco department.

SCULLY-JONES & CO., Chicago, Ill., have announced the appointment of direct factory sales engineers in several territories to serve machine tool builders. JAMES SKLENAR, HARRY GALVIN, and JAMES KEOUGH have been appointed as Wisconsin, New England, and Ohio representatives respectively. Announced is also the appointment of two tool distributors in the Syracuse, N. Y., area. ONONDAGA SUPPLY CO. and A. V. WIGGINS CO., INC. are the new distributors in Syracuse who will maintain stocks of standard tools such as drill and tap chucks, milling arbors, quick-change chucks, sleeves and sockets, and floating holders.

DAVID D. WALLACE was elected vice-president of Clearing Machine Corporation, Chicago, Ill. Mr. Wallace, an executive for over twelve years, has been most recently assistant to the president. He will continue to act in that capacity and will be

David D. Wallace, vice-president of Clearing Machine Corporation

responsible for the foreign operations of the company, including sales and manufacturing. Mr. Wallace has spent extended periods abroad organizing the export sales structure for Clearing. He managed the London, England, branch of the company in 1952 and 1953.

THOR POWER TOOL CO., Aurora, Ill., announces the appointment of three zone managers. J. P. STINE, former electric tool service engineer in the New York and Newark branches, has been named East Coast zone manager. C. B. BARON, formerly electric tool service engineer in the New York, Chicago, and Los Angeles branches, is the new West Coast zone manager. R. J. BURCH, former Birmingham electric tool service engineer, was appointed southeastern zone manager.

MARVEL ENGINEERING CO., designers and manufacturers of Marvel Synclinal filters, has moved to its own, recently completed plant at 7227 N. Hamlin Ave., Chicago, Ill. The one-story building is constructed to allow for further expansion when necessary. Plant lay-out and production lines are geared to greater efficiency and all shipments will continue to be made immediately or as specified.

UNITED TOOL SALES, 2024 Fulton Ave., Rockford, Ill.—a new nonstocking sales agency, organized to sell and distribute specialized holding and cutting tools—has been recently formed to serve manufacturers in the states of Illinois, Iowa, and Indiana. This agency will handle the products of a group of specialized tool manufacturers that are not now nationally represented.

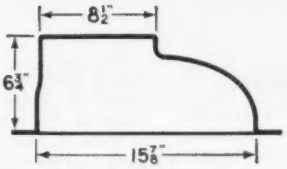
CHICAGO-LATROBE TWIST DRILL WORKS, Chicago, Ill., announces the appointment of WILLIAM T. HOPF as sales and service representative covering the Midwest in addition to the Chicago metropolitan territory. HARRY T. STRODTMAN has been named representative in Indianapolis covering the greater portion of Indiana and Kentucky.

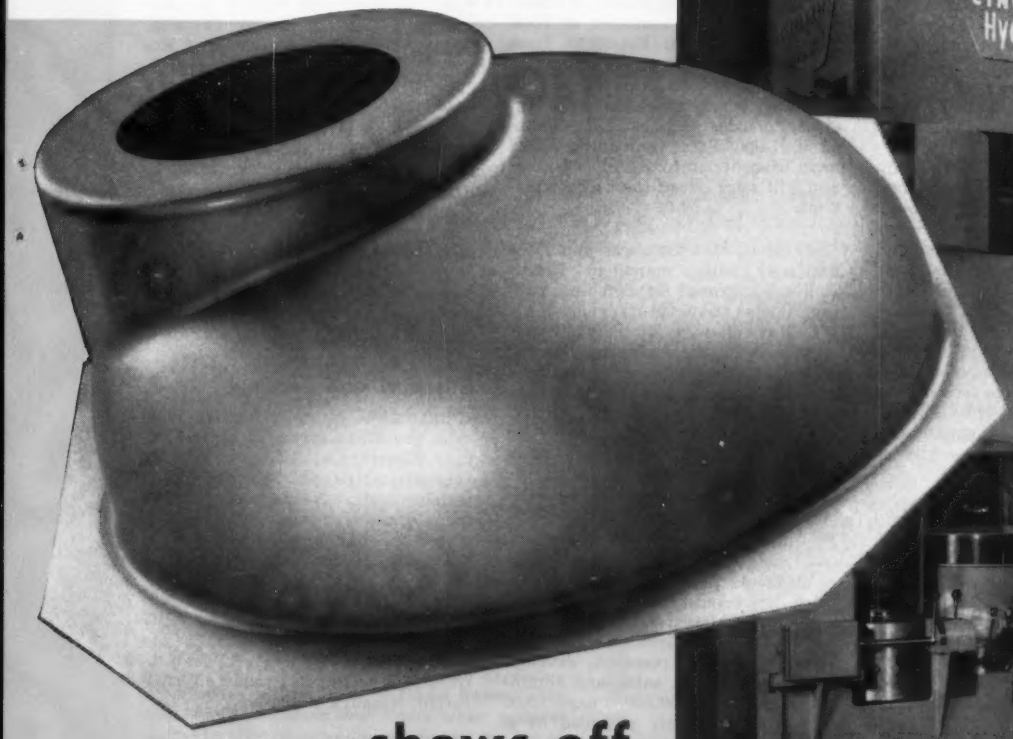
R. G. HASKINS CO., Chicago, Ill., announces the purchase of the N. A. STRAND DIVISION OF FRANKLIN BALMAR CORPORATION. Announced is also the appointment of E. P. GRISMER as manager of N. A. Strand Flexible Shaft, Inc. He will continue as chairman of the board.

ACME STEEL CO., Chicago, Ill., announces the appointment of ALFRED M. GOODMAN as supervisor of quality control; announced is also the appointment of J. ROBERT SANSOM as manager of distributor sales of the company's Dexion Division.

GEORGE LOCOTOS was appointed manager of the work order department at the Boston steel service plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Locotos has been with the company since 1950.

Material: .040"
Type 302 stainless steel





Cincinnati 26" Hydroform

shows off the advantages of

Hydroforming

complex stainless steel shape . . . drawn in one operation . . . using low cost, two piece tooling . . . without impairing high finish of the material.

The part, a top section of a cream separator, was drawn to desired dimensions without thin-out in *one* Hydroform operation. A 26" dia. blank having a 3½" dia. hole, was used. Tools—a male punch and a draw ring—were produced at a fraction of the cost of conventional draw tooling. As the part is a component of a food products container, finish was highly important. The part was Hydroformed without scratching or marring the polished stainless steel surfaces.

This one example is typical of the forming capabilities—the economical tooling—of Hydroforming. Can your company make use of these advantages? Call in a Cincinnati Milling field engineer. Let him assist you in evaluating Hydroforming for your manufacturing program. For a description of Hydroforming and specifications of the 8", 12", 19", 23", 26" and 32" machine sizes, write for your copy of new Bulletin M-1908.

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

LESTER-PHOENIX, INC., Cleveland, Ohio, announces that JOSEPH J. SCHMIDT, their representative in the Chicago area, has relocated his office to 5875 N. Lincoln Ave., Chicago, Ill.

ROBERT R. WARNS was appointed supervisor of the Los Angeles district office of the Dexion Division of Acme Steel Co., Chicago, Ill.

Indiana and Tennessee

ATKINS SAW DIVISION, Borg-Warner Corporation, Indianapolis, Ind., announces the following appointments: JOSEPH J. SWEENEY—director of marketing for both the Industrial and Hardware Divisions; JAMES E. BUTLER—sales manager for both Atkins Sales Division, Industrial and Hardware; B. L. OWENS—director of sales. Mr. Owens will be in complete charge of sales of Atkins products including branch warehouses now in operation throughout the country. He has been with the company for thirty-three years, most recently as general sales manager.

NATIONAL AUTOMATIC TOOL CO., INC., Richmond, Ind., announces the appointment of the following sales engineers: W. ATKINS, New York office; J. A. STAMBACK, Buffalo; E. G. MURPHY, Boston; W. E. MCKENZIE, Philadelphia; M. P. FRANKS, Chicago; and L. C. MAEFS, Los Angeles. The Detroit office—K. WEIST, H. MIKESELL, and the new office manager H. E. NELSON.

BYRON CONFER has been appointed Indiana district sales manager for Ettco Tool Co., Brooklyn, N. Y. Mr. Confer has had wide experience in the automotive and aircraft manufacturing industries in various engineering capacities including plant engineering, tool and machine design and methods work.

TIMKEN ROLLER BEARING CO., Canton, Ohio, has opened a new office and warehouse at 886 S. Third St., Memphis, Tenn. Timken's Memphis manager is R. P. HALL.

Michigan and Wisconsin

WHITMAN & BARNES, Plymouth, Mich., announce the following changes in personnel: DON ANDERSON from sales engineer, Indianapolis, to district manager of New York office. JOSEPH RODECKER from sales engineer, San Francisco, to sales engineer, Indianapolis. DON PARKER from sales engineer, Los Angeles, to sales engineer, San Francisco. HARRY PECHE and JOHN WIERS have been appointed sales engineers and will work out of the Chicago district.

DAVID C. MAXWELL was appointed assistant sales manager, Needle Roller Division of Kaydon Engineering Corporation, Muskegon, Mich. Mr. Maxwell was formerly director of sales with the American Electric Fusion Corporation, Chicago, and manager of sales engineering at the Grotnes Machine Works, Chicago. Prior to that he was with the Dodge Mfg. Co. as district representative in their Chicago office and with the Timken Roller Bearing Co. as sales engineer in Chicago for several years.

VICKERS INCORPORATED, Detroit, Mich., announces the completion of a new administrative and engineering center in suburban Detroit. Devoted entirely to research, development, engineering, sales, and administration, the 150,000-square foot facility is presently occupied by a working force of more than 700.

GEAR GRINDING MACHINE CO., Detroit, Mich., announces the acquisition of the Detroit Bevel Gear Co. and Republic Gear Co. and all subsidiaries. MR. EDGAR D. LEAN, president of Gear Grinding Machine Co., will operate the companies as president and chief executive officer.

GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wis., announces a division type reorganization of its four main branches. General managers in charge of each division are: ERICH C. WUSSOW, Kaukauna Machine & Foundry Division; ALLAN L. MCKAY, Cincinnati Bickford Division; ERWIN J. KAISER, Davis Boring Tool Division, and EDGAR L. MCFERREN, G & L Hypro Division. Messrs. McFerren, Wussow and McKay are also company vice-presidents.

KEARNEY & TRECKER CORPORATION, Milwaukee, Wis., announces the following personnel changes: JOHN P. BUNCE, staff assistant to the president in charge of manufacturing, was appointed assistant works manager for manufacturing operations at the Standard Machine Division plant. W. E. BRAINARD has been appointed chief engineer of the Aircraft Machine Tool Division.

Missouri and Texas

FRANK E. NUTT has been made sales promotion manager of the Century Electric Co., St. Louis, Mo. He succeeds ANTHONY NEHER, who is retiring. Mr. Nutt was recently transferred from the Chicago office, where he had served for several years as assistant manager.

L. J. HANEY ASSOCIATES, 456 Goethe Ave., Kirkwood, Mo., (suburb of St. Louis) have been appointed South Central representatives for the Punch Products Corporation, Niagara Falls, N. Y.

THOMAS L. NORTON has been promoted to the position of assistant plant manager at the Garland, Tex., plant of Temco Aircraft Corporation.

New England

NORTON CO., Worcester, Mass., announces the following appointments in the sales organizations. CALVIN K. KIRK, formerly district sales engineer, grinding machine division, Chicago, was appointed product research engineer at the company's

(Left to right) Erich C. Wussow, Allan L. McKay, Erwin J. Kaiser, and Edgar L. McFerren, general managers of the Giddings & Lewis divisions

"Same Day" Shipment

from Ex-Cell-O's huge stock of precision

Drill Jig Bushings

Whatever your requirements, Ex-Cell-O's complete bushing service will give you full satisfaction with every order! For your convenience, Ex-Cell-O maintains huge stocks of precision Drill Jig Bushings, and efficient expediting facilities which make possible "same day" shipment. This means orders are filled and dispatched from complete inventories in New York, Detroit, Los Angeles and London, Ontario, within a few hours after they are received!

Made of wear-resistant bearing steel, Ex-Cell-O Drill Jig Bushings are precision machined to meet Ex-Cell-O's rigid quality standards. Ex-Cell-O's exclusive hardening process produces bushings guaranteed uniform within 62-64 Rockwell "C". All Ex-Cell-O bushings are heat treated in Ex-Cell-O's atmosphere-controlled equipment. You can count on the tested and proved superiority of these high chrome, high carbon, oil hardening bearing steel bushings.

Call, wire or write Ex-Cell-O for the world's finest, fastest and most complete bushing service!

1. Headless Press Fit Bushings are used when center distances are too close for bushings with heads. **2. Head Liners** are used (in place of headless liners) when excessive pounding is involved. **3. Fixed Renewable Bushings** are used with liners when replacement bushings are required during the life of the jig. **4. Slip Renewable Bushings** are used with liners when two or more operations require change. **5. Headless Liners** are pressed permanently into the jig plate for accurate replacement of renewable drill bushings. **6. Head Press Fit Bushings** are used when bushing replacement is not required during the life of the jig.

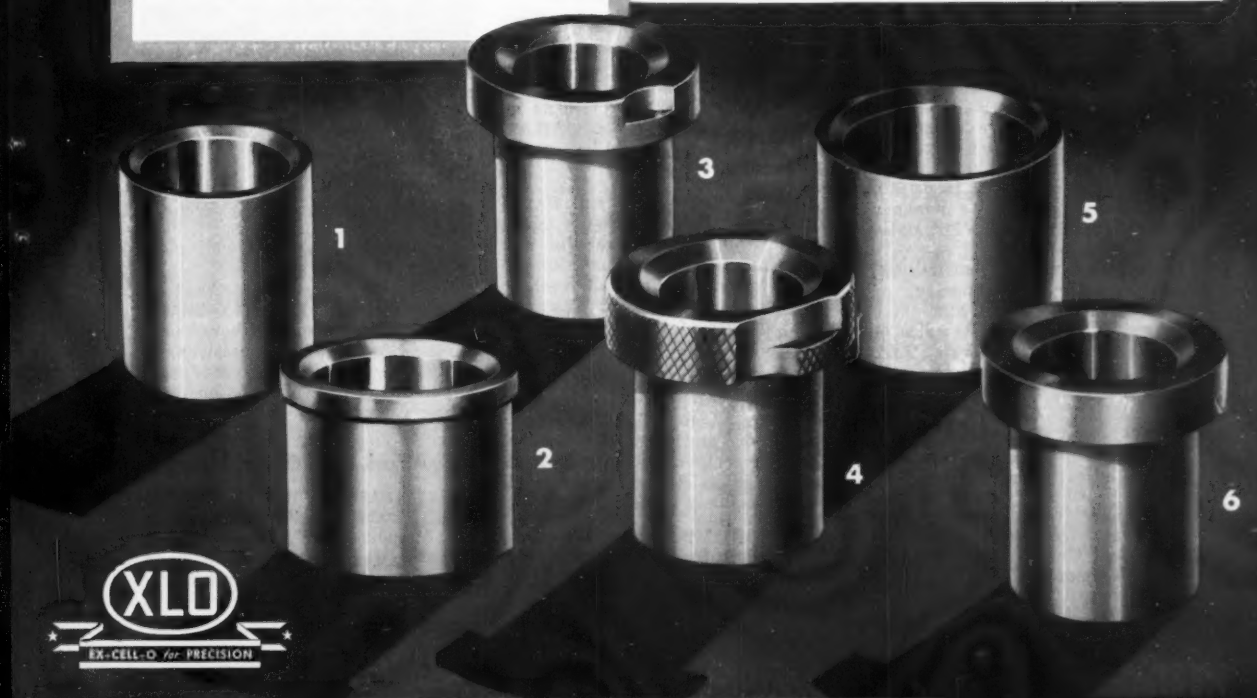
For your engineering and purchasing files: The complete Bushing Guide. Pictures and describes A.S.A. standard bushings, lists hundreds of Ex-Cell-O bushings available from stock. Write for as many copies as you need.

EX-CELL-O
CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-12



headquarters; EMENS GUERNSEY was named sales engineer in the foreign section of the grinding machine sales engineering department; and OAKLEY C. WALKER became sales and service engineer for the same department. WINTON A. VAGEDES, abrasive engineer, abrasive division, has taken over special accounts in New Jersey, following the retirement of H. Carl Steele. CHARLES A. BAILEY, field engineer, abrasive division in the Teterboro, New Jersey, office, has been promoted to abrasive engineer. JACK A. HEATH was appointed field engineer at the West Coast district office in Los Angeles.

EARL C. HUGHES, vice-president and secretary of the Bay State Abrasive Products Co., Westboro, Mass., has been elected a director of the L. S. Starrett Co., Athol,

Fabian Bachrach

Earl C. Hughes, director of L. S. Starrett Co.

Mass. Mr. Hughes is a former president of the Grinding Wheel Institute and is currently serving as vice-president and executive committee member of the Associated Industries of Massachusetts. Prior to his affiliation with Bay State in 1936, Mr. Hughes was assistant sales manager for the Norton Co., Worcester, Mass.

REED - PRENTICE CORPORATION, Worcester, Mass., subsidiary of Package Machinery Co., announces the opening of a new sales office at 1846 Owendale Drive, Dayton, Ohio. ERIK BRIERLEY will operate the Dayton office.

JOSEPH P. CROSBY, vice-president and director of the Lapointe Machine Tool Co., Hudson, Mass., has been appointed a director of the Metal-working Equipment Division, Business and Defense Services Administration, United States Department of Commerce.

ROY H. HELDENBRAND was appointed divisional manager of the Threadwell Tap & Die Co., Greenfield, Mass., a subsidiary of the Sheffield Corporation, Dayton, Ohio. Mr. Heldenbrand, who has served as office manager and controller of the Threadwell Division since 1946 and as assistant manager since last November, now succeeds PAUL W.

Roy H. Heldenbrand, manager, Threadwell Tap & Die Co.

POLK, whose transfer to Dayton as executive vice-president of the Sheffield Corporation was announced.

JOHN F. GIBNEY has been made sales representative for the Warner Electric Brake and Clutch Co., Beloit, Wis. Mr. Gibney will cover Maine, Rhode Island, New Hampshire, and northeastern Massachusetts with headquarters at 2136 Washington St., Canton, Mass.

B. C. AMES CO., Waltham, Mass., announces the appointment of KOREST-PETERSON CO., 900 Monroe Ave., N. W., Grand Rapids, Mich., as distributors for their products in western Michigan. Mr. ALLEN KOREST is manager of the Grand Rapids office.

SKINNER CHUCK CO. and SKINNER ELECTRIC VALVE DIVISION, New Britain, Conn., announce the appointments of GEORGE GOEPFRICH as director of engineering and development, and of ROBERT B. CLAY as chief engineer of the electric valve division.

MERTON C. GRILLEY, factory manager of the Producto Machine Co., Bridgeport, Conn., has been appointed vice-president. Mr. Grilley joined the company as an industrial engineer in 1950 and was named factory manager in 1953.

DAVID W. MYERS has been appointed vice-president of the Producto Machine Co., Bridgeport,

David W. Myers, vice-president of the Producto Machine Co.

Conn. Mr. Myers has been associated with the Producto Machine Co. for the past fifteen years and has been controller of the company since 1953.

LOUIS REISS, treasurer of Pratt & Whitney Co., Inc., West Hartford, Conn., has also been named controller of the company. He fills the vacancy created by the resignation of DAVID R. ANDERSON, vice-president-controller, who leaves the company to become controller of the Stanley Works, New Britain, Conn.

SKF INDUSTRIES, INC., Philadelphia, Pa., announce the appointment of TEK Bearing Co., Inc., Bridgeport, Conn., as distributor of SKF ball and roller bearings.

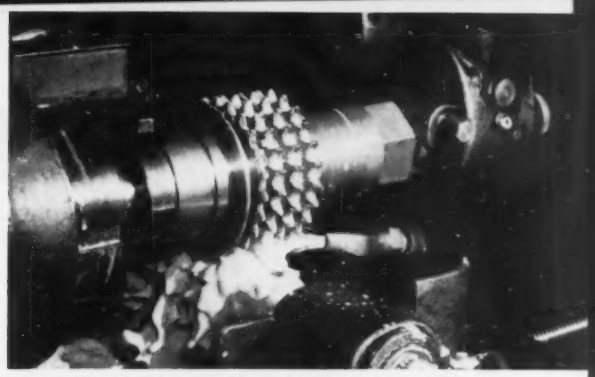
JONES & LAMSON MACHINE CO., Springfield, Vt., announces the following organization changes: JOHN E. BARBIER, formerly manager, Thread Tool Division, is appointed to the newly created post of manager of engineering, and coordinates all engineering activities of the company. W. F. COUTS, formerly sales manager, Thread Tool Division, is appointed as manager.

DR. MILES V. HAYES was appointed to the staff of Jones & Lamson Machine Co., Springfield, Vt., for long-range development studies. Prior to joining Jones & Lamson, Dr. Hayes was head of United Aircraft's Helicopter Section —research department, where he supervised machine computations on helicopter design and conducted wind tunnel experiments on helicopter rotors.

New York and New Jersey

METALWASH MACHINERY CORPORATION, Elizabeth, N. J., announces the appointment of W. DOLPH HORNBRUCH to represent the company in the eastern area of New York State.

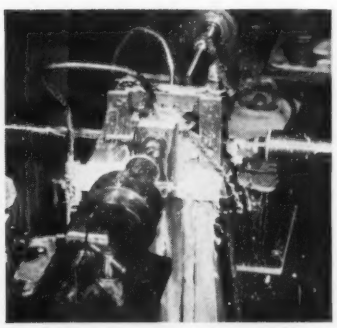
TURNING AND DRILLING. During the machining of a 9-in. piece using carbide-tipped tools, S.E.C.O. removes heat fast ... assures long runs, top speeds.



HOBBING. Flooding the cutting edges of a high-speed-steel hob working 1117 steel. S.E.C.O. provides lubricity and cooling power needed for long tool life.

CENTERLESS GRINDING. In grinding 4320 H steel pins. S.E.C.O. keeps wheels clean. Grinding dirt drops out quickly ... is not recirculated. Parts are rust-protected.

SUNOCO EMULSIFYING CUTTING OIL HANDLES 4 TOUGH JOBS ... EASILY



DRILLING AND REAMING. On steel forgings with a 350/400 Brinell, S.E.C.O. keeps drills cool ... gives clean cutting.

Whether you are shaping, hobbing, grinding, reaming, boring or milling, it will pay you to look into the advantages of SUNOCO EMULSIFYING CUTTING OIL.

Moderately priced, S.E.C.O. has been industry's most widely used soluble cutting oil for years. Higher-than-ever machining efficiency, increased detergency, easier mixing, and other added advantages are helping keep S.E.C.O. the leading emulsifying cutting oil in the country today.

For complete information about S.E.C.O. see your Sun representative. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-4.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY, LIMITED, TORONTO AND MONTREAL

SUNOCO

For more information fill in page number on Inquiry Card, on page 257

Joseph L. Knopf, vice-president of Morey Machinery Co., Inc.

JOSEPH L. KNOPF was appointed vice-president of the Morey Machinery Co., Inc., New York City. Mr. Knopf has been with the company for thirty-three years. He has served in many capacities such as assistant factory manager, production manager, etc., and a year ago was elected to the board of directors. At the present time Mr. Knopf is in charge of the procurement of machine tools for redistribution and will continue in that capacity.

WILLIAM I. MATTHES has been elected to the newly created post of executive vice-president of Arwood Precision Casting Corporation, Brooklyn, N. Y.

JOHN C. MCGREIVEY has been appointed industrial sales manager for the New York division of the Behr-Manning division of Norton Co.

ERICH GOBIEN has been appointed general methods engineer at the Kurt Orban Co., Inc., Jersey City, N. J. Mr. Gobien will supervise the installation of equipment and train plant personnel in the required setting up, operating, and servicing techniques.

HAROLD F. COLLINS has been appointed vice-president in charge of sales of Metals Disintegrating Co., Inc., Elizabeth, N. J. Mr. Collins has been a vice-president of the company since 1953.

JAMES B. SCUDDER has been appointed sales representative for the Warner Electric Brake & Clutch Co., Beloit, Wis. He will make his headquarters at company's New York area office, 36 Main St., Madison, N.J.

Ohio

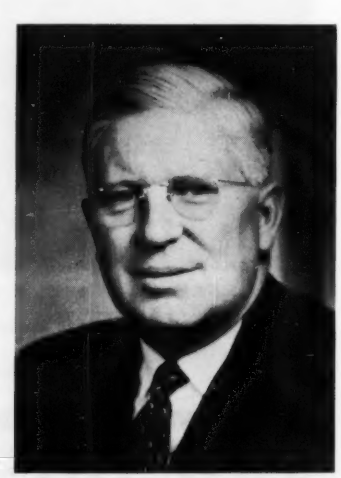
FRANK W. JENKINSON was appointed district manager in the Cleveland area for Adamas Carbide Corporation, Kenilworth, N. J.

E. W. BLISS CO., Canton, Ohio, announces the following appointments: HOWARD U. HERRICK, who has been president of the company, has been elected to the newly created office of chairman of the board in which position he will serve as chief policy officer of the company. ROBERT POTTER, formerly an executive vice-president, was elected president and chief administrative officer of the company, succeeding Mr. Herrick. Mr. Potter also was elected a director and a member of the executive committee, succeeding J. H. TREDINNICK. Mr. Tredinnick, who has resigned as an executive vice-president, director and member of the executive committee, will remain as a vice-president and as a consultant to the president.

Roland Lehr, president and general manager of Baker Brothers, Inc.

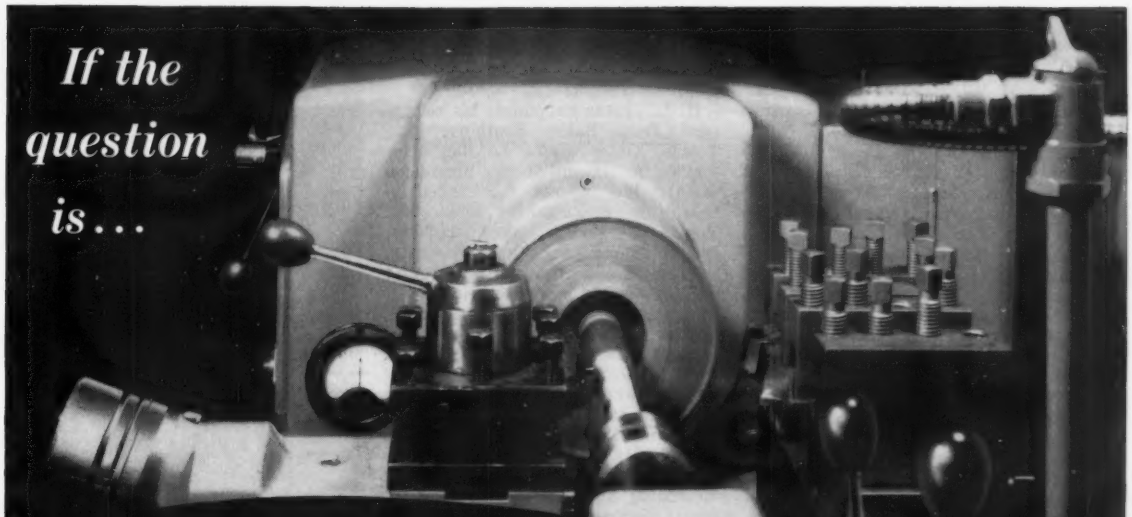
ROLAND LEHR has been appointed president and general manager of Baker Brothers, Inc., Toledo, Ohio. At the same time MR. A. L. BAKER's appointment as chairman of the board of directors was announced. Prior to joining the company, Mr. Lehr served as sales manager of the Quincy Compressor Co. and there he was instrumental in making Quincy known in the small air compressor field.

OSBORN MFG. CO., Cleveland, Ohio, has established four new sales districts and has promoted four of its field representatives to head these districts. Announced is also the establishment of four sales and service offices as headquarters of the districts in Detroit, Cleveland, New York, and Los Angeles. The following men will head these districts in the position of district manager:

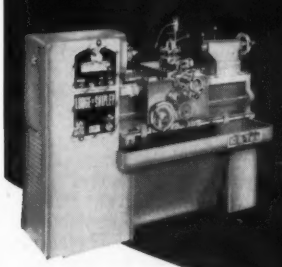


(Left) Howard U. Herrick, chairman of the board; (center) Robert Potter, president; and (right) J. H. Tredinnick, director of E. W. Bliss Co.

If the question is...



PRODUCTION SPEED?
MULTIPLE-PIECE ACCURACY?
SMALL INVESTMENT?



Lodge & Shipley 10" Hi-Turn is the answer!

The low base price includes electrical equipment, ammeter, direct reading cross feed dial, dial for apron handwheel, pan, multiple length stop arrangement for use with either flat or round templates, pump and tubing, etc.

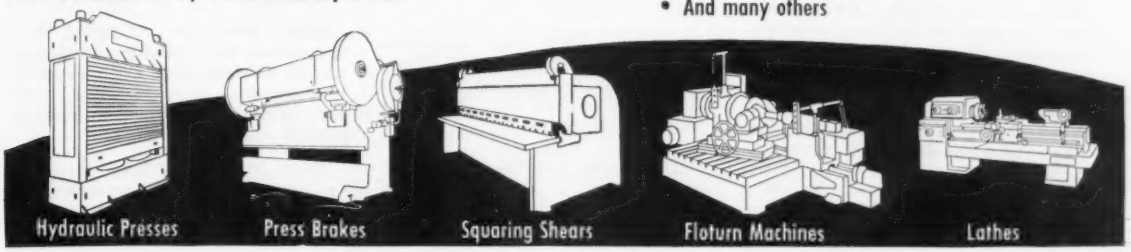
The Lodge & Shipley 10" HI-TURN Lathe is a completely new concept in lathes. Designed for high production at low cost, it eliminates rarely used features . . . includes many standard features never before found at any cost.

The result is a rugged lathe of high accuracy on single or multiple-piece work. Provides productive capacity at a price substantially below conventional lathes. We can prove more production per lathe dollar . . . more production per operator hour!

Find out about the Lodge & Shipley 10" HI-TURN. Write today for full, detailed literature, Bulletin 300, **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

Proved-for-Production Features:

- 9 color-coded speeds up to 3000 RPM and 5 HP
- Totally enclosed 100% anti-friction quick change gear box with rugged all-spur gearing
- Dynamically braked motor in leg
- Template-type length stops
- Flame-hardened replaceable steel bedways
- Hardened and ground cross slide ways
- Direct reading cross feed and top slide dials
- Provision for rear tool block and multiple tools
- Magnetic feed clutch and brake
- And many others



For more information fill in page number on Inquiry Card, on page 257

G. B. PECSOK, eastern district, with office located at 60 E. 42nd St., New York City. Within this district will be individual sales territories covering New York City, eastern New York State, eastern Pennsylvania, New England, Maryland, and Virginia. P. A. MALLING, Western district, with office located at 5411 Whittier Blvd., Los Angeles. The territories within this district serve California, Oregon, Washington, Arizona, and Utah. J. H. MCGINNIS, Detroit district, with office located at 10701 W. McNichols Ave., Detroit. The territories in this district cover Detroit and eastern Michigan. C. WILLIAM NEWMAN, East-Central district with offices at 5401 Hamilton Ave., Cleveland. The territories in this district cover northern Ohio, western New York, and western Pennsylvania.

MACHINE TOOL DIVISION, WARNER & SWASEY CO., Cleveland, Ohio, announces division of the present Chicago territory into three independent districts—Des Moines, St. Louis, and Chicago—each with a separate district manager. CHARLES MAGILL, district manager for Des Moines territory; at St. Louis, PHILIP A. KENNEDY becomes the new district manager; and the Chicago territory, which will now include only the Indianapolis and Chicago areas, will be served by CRAIG R. SMITH as district manager. Concurrent with these changes, OTTO R. SCHUBERT is appointed new district manager for the Detroit territory, with VIRGIL P. KARNS becoming field engineer in the same area. In addition, GILBERT LUTZ is appointed field engineer for the territory served by the company's Dayton, Ohio, office. Announced also is the appointment of the new European district manager. Receiving this appointment is ROBERT L. GROVES, who will make his headquarters in Paris and from there will direct sales of the company's machine tools, Gradall earth-moving equipment, and textile machines throughout the Continent.

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, announces the formation of a new department—designated as the contract production department—at the Ivanhoe Division of the company. RICHARD E. MCDONALD has been appointed to the position of subcontract production manager. Mr. McDonald has been with the company for fifteen years during which time he held various positions in the production, manufacturing, and engineering departments.

METAL CARBIDES CORPORATION, Youngstown, Ohio, announces the appointment of JOSEPH W. MULLEN, Suite 716, Dupont Circle Building, 1346 Connecticut Ave., N. W., Washington, D. C., as representative in the Washington area. Mr. Mullen formerly represented Norris-Stamping & Mfg. Co. of Los Angeles.

H. L. TIGGES announces his retirement from Baker Brothers, Inc., Toledo, Ohio, where he has been serving as executive vice-president, to enter into business for himself as consultant on machine tools. Mr. Tigges has served Baker Brothers, Inc. for forty years in engineering, sales, and executive capacities and will continue to serve them in an advisory capacity. He is a former president of both the National Machine Tool Builders' Association and the American Society of Tool Engineers, and a member and former president of the Toledo Sales Executive Club. During 1948 and 1949 he served part time as advisor and consultant to the National Security Resources Board. Mr. Tigges, in his new activity, will temporarily operate from his office in his home at 3600 W. Bancroft St., Toledo, Ohio.

MOTCH & MERRYWEATHER MACHINERY CO., Cleveland, Ohio, has sold its Triple M Products Division, which makes a line of multiple-purpose garden tools. Purchaser is Hahn, Inc., Evansville, Ind.

WILLIAM F. FRITZ has been appointed plant superintendent of the Boye & Emmes Machine Tool Co., Cincinnati, Ohio. Mr. Fritz was formerly chief engineer of the Acme Machine Tool Co. and plant superintendent of Leyman Corporation.

WILLIAM DOONAN has been appointed midwestern sales manager for the Cleveland Instrument Co., Inc., Cleveland, Ohio. His territory will include western Ohio, Michigan, Indiana, Illinois, and Wisconsin.

SCOVILL MFG. CO. has announced that the Cincinnati sales office and warehouse will move to a new building now being completed at 2330 Glendale Millford Road, Evendale, Cincinnati, Ohio.

TECHNEERING SALES, INC., 53 Park Ave., Dayton, Ohio, has been appointed representative in southwest Ohio for MOHAWK TOOLS, INC. of Montpelier, Ohio.

R. L. BOBO, regional sales manager for the Federal Pacific Electric Co., Newark, N. J., has been appointed manager of the company's regional plant at Cleveland, Ohio.

EARL R. DEW was appointed sales representative of the Clearing Machine Corporation, Division of U. S. Industries, Inc., in the Toledo, Ohio, territory.

PAUL HAFER has been appointed superintendent of the Great Lakes Regional Plant of Federal Pacific Electric Co., Cleveland, Ohio.

Pennsylvania and Maryland

CRUCIBLE STEEL COMPANY OF AMERICA, Pittsburgh, Pa., has elected VAN H. VIOT vice-president—employe relations. Mr. Viot was formerly director of employe relations and will continue to direct all activities concerned with the relationship

Van H. Viot, vice-president—employe relations, Crucible Steel Company of America

of employes to the company. Mr. Viot will continue to maintain offices at the company's headquarters in the Oliver Building, Pittsburgh, Pa. He became associated with Crucible in 1954 when he was named Director of Employe Relations for the company.

CARL HAUGH was appointed district sales manager, rolling mill equipment, of the Loewy-Hydropress Division, Baldwin-Lima-Hamilton Corporation with headquarters at the Pittsburgh office. Mr. Haugh, a mechanical engineer, has been a specialist in the field of rolling mills and steel mill equipment for twenty-five years.

WILLIAM RODGERS, sales vice-president of Blaw-Knox Co., Pittsburgh, Pa., has been elected a director. Mr. Rodgers joined the company in 1953 in the new post of general sales manager and later was elected vice-president. T. HERBERT HAMILTON has been named general counsel and was elected secretary of the company.

KENNAMETAL INC., Latrobe, Pa., announces the following appointments: EDWARD J. NOVACK—special representative to machine tool builders; WILLIAM J. WEBER—assistant process engineer.

PAUL BIXLER has been promoted to manager of the International Division of F. J. Stokes Machine Co., Philadelphia, Pa.

Eugene C. Clarke, Jr.—president of Chambersburg Engineering Co.

EUGENE C. CLARKE, JR. has been elected president of Chambersburg Engineering Co., Chambersburg, Pa. Mr. Clarke has been associated with the company in the capacity of works manager and later general manager. He succeeds his father, who is retiring from active management of the company, but who will continue on its board of directors.

PANGBORN CORPORATION, Hagerstown, Md., has appointed three new sales engineers. T. O. WEAVER will specialize in the application of abrasives and wear-resistant plates for blast cleaning in the Chicago area. ALEXANDER J. SZABO will specialize in abrasives and wear-resistant plates in the Detroit area. PAUL P. BUTLER will sell all Pangborn products in the Pittsburgh area.

Obituaries

ROBERT A. HORNER, retired division manager of the Machine and Small Tool Divisions, Barber-Colman Co., died February 28th at the age of sixty-six years. Mr. Horner was with Barber-Colman for thirty-seven years during which time he was closely associated with the advances in the gear cutting industry. In 1930 he became sales manager of the Machine and Small Tool Divisions, and he was made division manager in 1950, and retired in December, 1955. He was a life member of the Metal Cutting Institute.

A. ORAM FULTON, chairman of the board and treasurer, Wheelock, Lovejoy & Co., Inc., Cambridge, Mass., died on February 20. Mr. Fulton had been associated with the company in various positions for forty-six years.

New Books and Publications

THE MACHINIST DICTIONARY. By Fred H. Colvin. 496 pages, 6 by 9 inches. Published by the Simmons-Boardman Publishing Corporation, 30 Church St., New York 7, N. Y. Price, $7.50.

This work is a compilation of machine terms, parts, and standards in a comprehensive form for quick and easy reference. Tables, charts, lists, and illustrations are used to clarify and extend the text. While a brief definition suffices in many instances, detailed explanations are given where necessary. The dictionary is directed to individuals concerned with machine building or repair, including designers, purchasing agents, and operations men. It has high value in vocational education programs.

DESIGN MANUAL FOR ROLLER AND SILENT CHAIN DRIVES. By Jackson & Moreland. 95 pages, 8 1/2 by 11 inches. Published by the Association of Roller and Silent Chain Manufacturers, P. O. Box 5398, Indianapolis, Ind. Price, $3.50.

This manual describes both theoretical and practical engineering principles involved in applying chain drives. The primary purpose of the text is to serve as an educational aid; consequently, it has been distributed to engineering colleges and universities throughout the country.

Mechanical engineering professors were consulted as to content and arrangement. As a result, an acceptable balance has been maintained between the basic principles involved in the design of drives and the practical problems of actual installations. Thus, the manual is also useful to practicing engineers and personnel who encounter problems of mechanical transmission of power.

MACHINE TOOL RECONDITIONING. By Edward F. Connelly. 533 pages, 7 1/4 by 10 1/2 inches; 712 illustrations. Published by Machine Tool Publications, St. Paul, Minnesota. Price, $10.75.

This book provides a clear explanation of the hand scraping process and its application to machine tool reconditioning. Five kinds of machine tools are used as examples of how the art of hand scraping is applied, and line drawings correlated with the text are used to illustrate important steps in the reconditioning process.

A practical exposition for practical men, this book is designed to guide workmen on the job, to suggest short cuts, and to assist foremen in supervising machine tool reconditioning operations.

SWISS-TYPE AUTOMATICS. By G. A. W. Morgan. Part One, 64 pages, 5 1/2 by 8 1/4 inches; Part Two, 56 pages, 5 1/2 by 8 1/4 inches; Part Three, 47 pages, 5 1/2 by 8 1/4 inches. Published by The MACHINERY Publishing Co. Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y. Price, 75 cents each part.

These three latest additions to the British "yellow back" series cover various types of Swiss-type automatic screw machines in which the bar material is revolved to provide the required cutting speed and at the same time is moved axially to provide the longitudinal function of turning. Part One describes the characteristics of Swiss-type automatics, the principles of tooling design, and process planning, and takes up several specific makes of machines in detail. Part Two covers various attachments such as single-, two-, and three-spindle drilling, slotting, under-cutting, and taper attachments. Part Three takes up the design of cams and tools for a number of typical work-pieces including a knurled screw, a control valve stem, a knurled bush, an arbor blank and a pinion blank. All three books are well illustrated.

BALL BEARING MAINTENANCE. By Johnny Riddle. 170 pages, 6 by 9 inches; 300 illustrations. Published by the University of Oklahoma press, Norman, Okla. Price $6.

This book is designed to aid the consumer in understanding the basic principles of ball bearing maintenance. Included are an explanation of the basic bearing types and their variations, in addition to design changes which may affect the suitability for mounting; a thorough study of unit failure with photographs taken as the bearing actually failed, and a technical analysis of the failure and its cause.

TOOL AND CUTTER GRINDING. By Robert S. Connell. 159 pages, 5 1/2 by 8 1/2 inches. Published by The MACHINERY Publishing Co., Ltd., National House, West St., Brighton, 1 England. Sold in the United States by THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N. Y. Price, $3.

This useful manual describes and illustrates the practical methods of servicing those tools and cutters which require sharpening or regrinding. Detailed explanations are given to show how the basic princi-

ples of universal grinding practice can be applied to this special field and the various attachments and equipment that are currently in use.

There are seven chapters covering the following subjects: Equipment for Tool and Cutter Grinding; Turning, Planing, Shaping and Slotting Tools; The Grinding of Twist Drills; The Grinding of Milling Cutters; Thread-Cutting Tools; Broaching and Gear Cutting Tools; and Cemented Carbide Tools.

HANDBOOK OF FASTENING AND JOINING OF METAL PARTS. By Vallory H. Laughtner and August D. Hargan. 622 pages, 8 1/2 by 11 inches; 262 illustrations. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 6, N. Y. Price, $15.

An extensive compilation of data on standards, performance, and methods to aid in selection of most suitable methods for assembling metal parts and products. Planned to help both designers and production men, the book covers accepted practice in assembling or fastening metal parts. It discusses such factors as the joining of dissimilar metals, the types of resins and adhesives that can be used to fasten metal both to metal and to other materials, and the advantages and disadvantages of different types of joints.

Screw thread and nuts, collars, couplings, keys, brazing, soldering, and types of welding are covered in detail. Included is information for welded strengths in various ferrous and non-ferrous alloys.

A 200-page section, prepared in picture-and-caption manner, is devoted to techniques for solving a number of special problems in fastening and joining—methods for assembling welded frames and bases for machines, joining sheet metal without fasteners, preventing loosening of threaded members, etc.

1955 BOOK OF ASTM STANDARDS: PART 1—FERROUS METAL. 1834 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $13.50.

Part 1 of the seven-part 1955 Book of ASTMA Standards is 11 per cent larger than the 1952 edition and contains 125 standards that are new or have been revised since the 1954 Supplement was published a year ago. Since 1952, 211 standards are new or have been revised.

It contains standard and tentative specifications, methods of test, and definitions for steel piping materials; flat products; bars, bolts, and rivets; billets, forgings, and axles; rails and accessories; railroad wheels; springs; concrete reinforcement; corrosion-resisting steel; metallic coatings for steels; welding rods; wrought iron; cast iron; malleable iron; magnetic materials; ferro alloys; and metal powders; as well as general methods of testing. It is especially important in the heavy machinery, railroad, and construction industries.

The remaining parts of the 1955 Book of ASTM Standards will be published by the Society as rapidly as the editorial and press work can be completed, with the last part expected off the presses about February 1956.

STANDARDS AND DIMENSIONS FOR TAPS AND DIES. 80 pages, 8 1/2 by 11 inches. Published by the Tap & Die Division, Metal Cutting Tool Institute, 405 Lexington Ave., New York City.

This 1955 revision of tap standards is outlined in detail with conversion tables and tables of tap recommendations for classes of thread 2, 3, 2B, and 3B. Tapping and the minor diameter of tap holes are discussed, and included is a chart of tap drill sizes. Contained are also the complete commercial standards as adopted by the Tap & Die Division (MCTI).

ENGINEERING DRAWING AND GEOMETRY. By Randolph P. Hoelscher and Clifford H. Springer, 514 pages, 8 1/2 by 11 inches. Published by John Wiley & Sons, Inc., 400 Fourth Ave., New York 16, N. Y. Price, $8.

This single volume combines all the material needed for course work in both Engineering Drawing and Engineering (or Descriptive) Geometry. An understanding of engineering principles is emphasized rather than mere manual drafting skills. Treatment of the subjects is complete enough to serve advanced professional drafting courses as a reference or text. All tables and other fundamental drafting data used in the text are included in an extensive appendix.

Among the special features are chapters on map, structural, and architectural drawings. Included is up-to-date material on design for interchangeable assembly, covering limit dimensioning and positional tolerancing. Useful information on shop practices is also presented. Axonometric projection is treated in terms that are easily understood by the beginner. Many concepts of projection are explained and illustrated with step-by-step construction.

In the sections devoted to descriptive geometry, the auxiliary plane method has been used almost exclusively. The revolution of an oblique plane has been used only where it is distinctly advantageous. Problem sections in each chapter are adequate for at least four semesters of work without repetition.

Coming Events

APRIL 10 - 12 — Twelfth annual meeting of the Metal Powder Association and 1956 METAL POWDER SHOW in Cleveland, Ohio, with headquarters at the Hotel Cleveland. Additional information can be obtained from the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.

MAY 9 - 11—National Spring Technical Meeting and Welding and Allied Industry Fourth Exhibition of the AMERICAN WELDING SOCIETY will be held at Memorial Auditorium, Buffalo, N. Y. For further information write to the American Welding Society, Inc., 33 W. 39th St., New York 18, N. Y.

MAY 14 - 17—First Design Engineering Show will be held at Convention Hall, Philadelphia, Pa. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 14 - 17—AMERICAN SOCIETY OF MECHANICAL ENGINEERS sponsors a conference to study industry's problems in design engineering. It will be held at Convention Hall, Philadelphia, concurrently with the First Design Engineering Show. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MAY 17 - 19—NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS—Thirtieth Engineering Industries Exposition in conjunction with its Annual Convention at the Statler Hotel in New York City. For further information, write to Harold Becher, chairman of publicity, New York State Society of Professional Engineers, 1941 Grand Central Terminal, New York 17, N. Y.

MAY 17-19—Engineering Industries Exposition, Statler Hotel, New York City. The Consolidated Edison Co. will exhibit a scale model of the reactor which it is constructing at Peekskill, N. Y.

* * *

Film on Transfer Presses

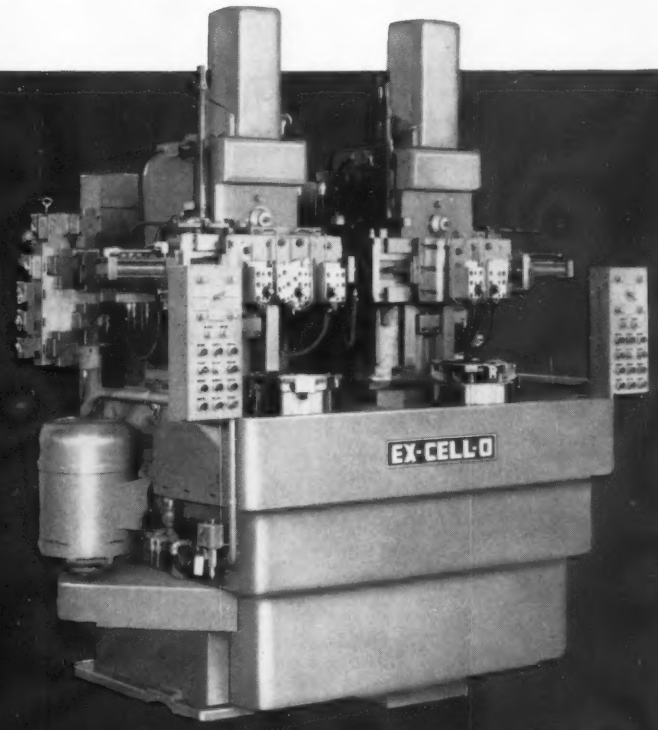
Clearing Machine Corporation, Division of U. S. Industries, Inc., Chicago, Ill., has recently completed a sound-color movie based on the company's line of automatic, transfer feed presses. The movie, called "A Modern Fable," is on 16-millimeter film and runs for approximately twenty minutes. The color movie is available to any industrial concern or organization. Write to U. S. Industries, Inc., Chicago Regional Advertising Department, 6201 W. 63rd St., Chicago 38, Ill.

New, Flexible

EX-CELL-O 2-STATION VERTICAL..

XLO
EX-CELL-O for PRECISION

PERFORMS VARIETY OF PRECISION OPERATIONS



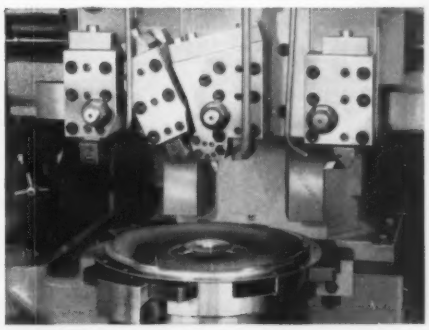
EX-CELL-O STYLE 432 VERTICAL PRECISION BORING MACHINE has two independent hydraulic systems. No cams to change.

The Ex-Cell-O Style 432 completes the operations on both sides of this transmission torque converter cover in one machine cycle.

Ex-Cell-O's new Style 432 Vertical Precision Boring Machine was designed to speed production *where flexibility is essential.* Vertical construction means convenience in loading and unloading parts, also ease in adjusting and changing tools. Precision turning, boring, facing, grooving, and chamfering are performed alone, or in any combination.

Tool one station for operations on one side of a part; tool the other station for different operations on the other side. Or—let both stations do identical operations simultaneously or in sequence. Or—each station works as an independent machine. Different cycles are obtained through switches, and adjustment of dogs and orifices.

For complete information, call your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit for Bulletin.



Tooling and chucking equipment of the left station. Slides are wide enough to accommodate tools on both sides of the centerline of a part.

EX-CELL-O CORPORATION
Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

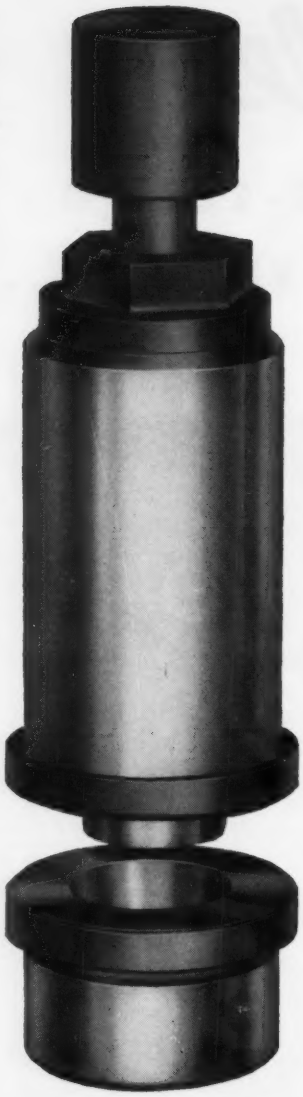
56-2

STANDARDIZED

UNIVERSAL INDEX PLUNGERS

SAVE TIME
SAVE MONEY

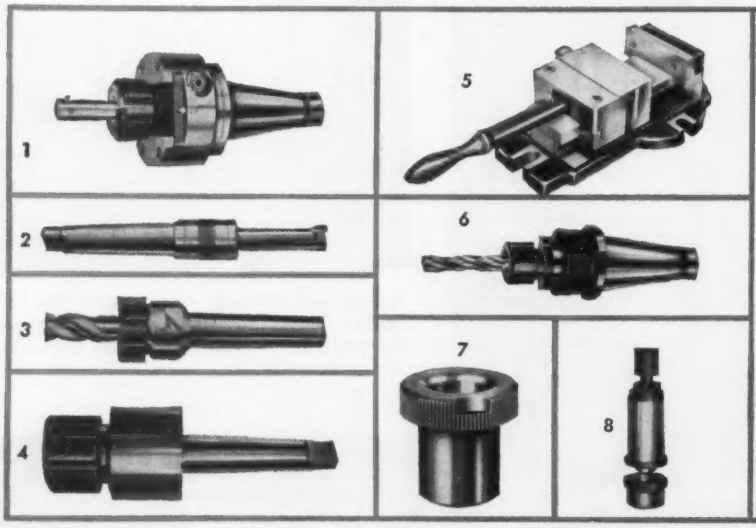
Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately ¼ the cost of specially made plungers.



Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.

Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.



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Modern, Mechanical, Face-Type Seals —
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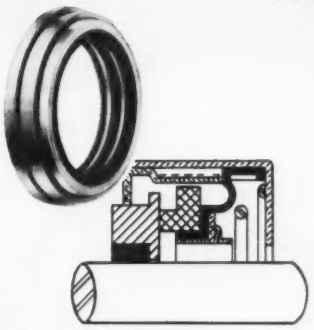
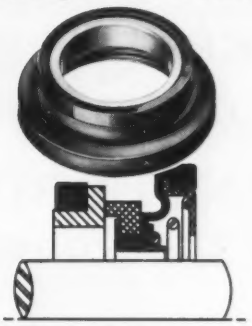
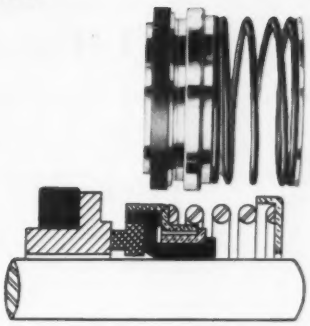


STYLE GU — A packaged sealing unit containing both rotating and stationary seal faces enclosed in metal housing. Important applications in **machine tools** and **power transmission equipment.** Stock sizes for shafts .250 through 4.000.

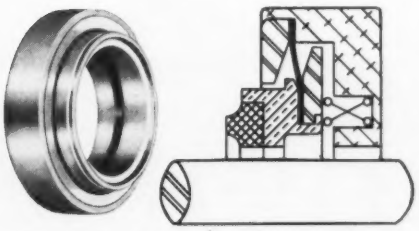


STYLE SGU—A factory-assembled unit-type seal for the small budget user. Widely used in **appliance** field. Stock sizes for shafts .250 through 1.000.

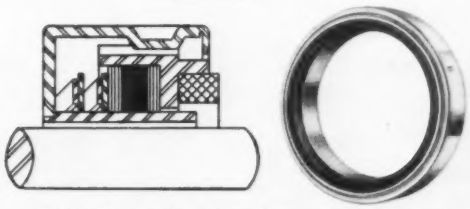


ROTO-FLEX — Rugged flexibility. Only 3 parts. Single or double units. Many applications in **pumps** and **compressors.** Stock sizes for shafts .250 through 4.000.

STYLE RFO—A specially designed Roto-flex seal, for installation outside the stuffing box. Stock sizes for shafts .250 through 4.000.



STYLE DPC — A high-speed, carbon-faced seal, for use where lubrication is poor or where shaft RPM and resulting friction are high. Ideal in many **machine tool** applications. Stock sizes for shafts .250 through 4.000.



STYLE HH—Absolute minimal space (both radial and axial) under extreme conditions of temperature, pressure and seal face surface speed. Features pressure balance when fluid pressure is applied internally or externally. Of particular importance to the **aircraft** industry. Stock sizes for shafts .250 through 4.000.

These are only a few of the countless sealing problems now being solved by

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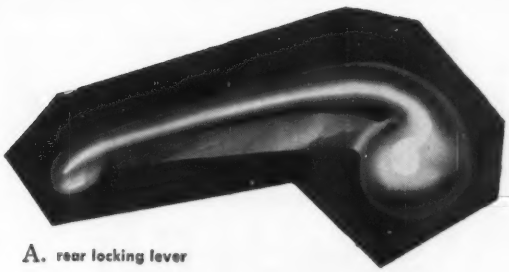
give THUNDERBIRD tops a snug fit the year around

The Motor States Products Division of Detroit Harvester Co.—a major supplier of top assemblies for convertibles—has found Mueller Brass Co. forgings an ideal answer for securely fastening down the tops on the Ford Thunderbird. In a summer shower or in the snow of winter the top is always snug and draft-free. There are a pair of each of the three Mueller Brass Co. forgings shown here used in locking the Thunderbird top securely around the sides and rear deck. The locking lever (A) is incorporated in the top and operates a locking pin that fastens into the rear hold down clamp (B). A pair of side hold down clamps (C) are located just behind each door opening and clamp fasteners on the top hook into these forgings to rigidly hold the top in position. These forgings hold the necessary close tolerances and provide an excellent surface for buffing and chrome plating. In addition, the price is favorable and deliveries are good. For these reasons, as well as their inherent strength and durability, a switch to Mueller Brass Co. forgings can prove advantageous. Write today for our engineering manual (No. H-58565) . . . or better yet, call in one of our engineers to investigate possible forging applications in your products.



A. rear locking lever

B. rear hold down clamp

C. side hold down clamp

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Mueller Brass Co. Forgings Engineering Manual H-58565 ☐

Tuf Stuf Aluminum Bronze Alloys Engineering Manual H-58563 ☐

600 Series Bearing Alloys Engineering Manual FM-3000 ☐

Copper Base Alloys in Rod Form Engineering Manual FM-3010 ☐

METALS AND ALLOYS REVIEW

by FRANK M. LEVY, Director of Research

The other day one of our sales engineers stopped in to discuss gear applications and the subject got around to the amount of zinc permissable in gear and bearing alloys. Engineering books state that zinc is not desirable in bearing alloys. While this statement is true as regarding the commonly used copper-tin and copper-tin-lead alloys, it does not necessarily apply to other types of alloys. The 600 series bearing alloys, in which I am keenly interested, depend upon a high zinc content along with several other metal constituents to provide them with their fine bearing properties.

My explanation to our sales engineer was somewhat as follows: The question as to whether or not zinc is detrimental in a bearing alloy depends upon the remaining constituents in the alloy. A comparatively small amount of zinc is detrimental in a phosphor bronze alloy containing 80% copper, 10% tin and 10% lead. A zinc content of 4% is permissible in a bearing alloy containing 88% copper, 4% tin and 4% lead when used in an application not subject to heavy loads. In these alloys the tin combines with some of the copper to form a hard copper-tin constituent which is distributed through the soft copper matrix, or mat of copper. The higher the percentage of tin present, the greater the quantity of hard copper-tin constituent formed. Zinc also combines with copper increasing the hardness of the matrix. Therefore, when zinc is present along with a high tin content, the matrix becomes too hard and is "out of balance" resulting in poorer bearing qualities.

In the 600 series, copper, silicon, manganese, etc., are present with zinc. There is sufficient manganese present to combine with the silicon to form a purple manganese silicide which is embedded in the copper-zinc matrix. *Since the manganese-silicide constituent has a much higher micro hardness than the copper-tin constituent in phosphor bronze, the matrix of the 600 series alloys can have a higher hardness without impairing the bearing properties. In this instance, zinc is not detrimental but desirable because it produces an alloy with a high Brinell hardness which resists pounding and distortion.*

Like many engineers, we, too, were skeptical of the bearing properties of the first 600 alloy developed. A manufacturer of worm driven truck transmissions was having difficulty with the failure of chill cast high tin bronze gears in busses used in the hilly section of Los Angeles and Pittsburgh, and solved his problem by using gears made from 600 metal.

Since that time, we have had over a hundred successful applications on difficult bearing problems where cast bearing bronzes have failed. An interesting observation is that once a customer uses 600 alloys, he not only finds other applications, but continues to use it over a long period of years. Our original customers are still on our books.

In conclusion, we agree that zinc is detrimental to the bearing properties of the phosphor bronze type of alloys, but is of benefit to the 600 series alloys, *as it makes a harder matrix*, permitting the alloy to resist pounding action better than the softer phosphor bronze alloys.

I've just about run out of space for this time but we'll have another subject for discussion later. If you have any problems or questions about non-ferrous alloys, just write me here at Mueller Brass Co. and we'll see what we can do.

MUELLER BRASS CO.

PORT HURON 35, MICHIGAN

170

For more information fill in page number on Inquiry Card, on page 257

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The Finishing Specialist from Lowe Brothers is more than a seller of paints and finishes. He is a production specialist, well-versed in all processes and materials, and the latest in finishing techniques and equipment.

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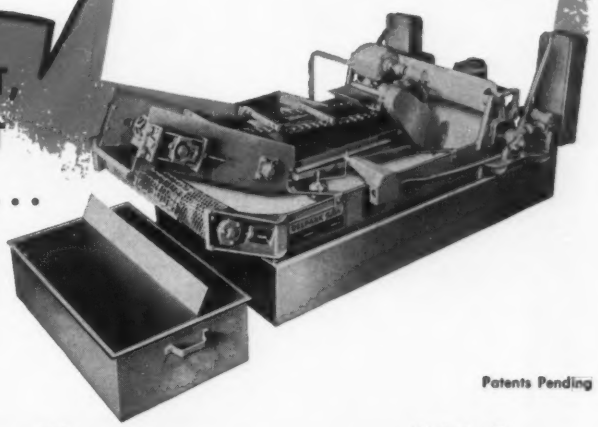

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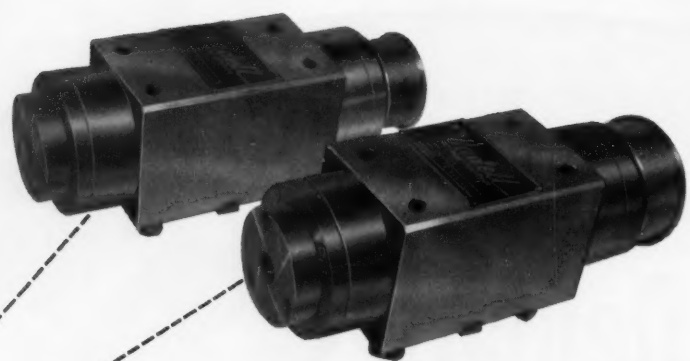
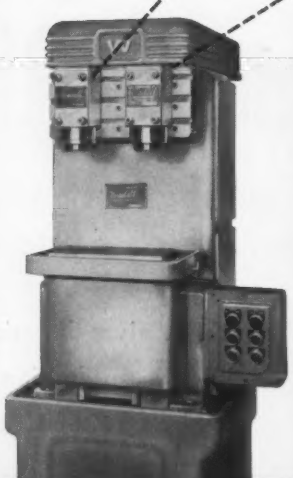
WADELL BORING MACHINES FEATURE QUALITY BORING SPINDLES





Model VBM - Vertical precision boring machine

Wadell Vertical Precision Boring Machines feature boring spindles of unsurpassed **QUALITY**. More than a quarter century of manufacturing experience has enabled Wadell to develop technique, facilities and skill which provides this quality to the user.

Advanced methods plus skilled craftsmen, expert at hand fitting and assembly adds up to optimum spindle accuracy and lower cost. Spindle design and selection of bearings is afforded equal consideration.

Whatever your boring machine requirements, Wadell can furnish ball or roller bearing spindles you can be confident will perform to your complete satisfaction.

The Wadell, model VBM, vertical precision boring machine, rotary positioning tables and quality boring spindles provide really high production at very low comparable cost.

Wadell is prepared to furnish machines completely tooled and ready to operate in your plant. Forward your parts prints to Wadell and get complete **PRODUCTION PACKAGE** cost.

write for further information

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Now... Gorton Milling Machines Feature Hydraulic 3-Dimensional Controls

"Pencil Pressure" Does the Work

Gorton now offers you several models of Super-Speed Vertical Mills equipped with sensitive and accurate hydraulic controls featuring feeds up to 40 inches per minute.

AVAILABLE 3 WAYS

1. Vertical action only
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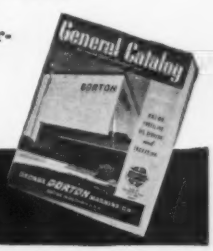
3. Three-dimensional combination

Gorton Milling Machines with hydraulic Tracer Control must be ordered as such. Hydraulic equipment is not an attachment but a permanent installation.

For die or mold work (single or multiple units), production profiling and duplicating — short runs, experimental pieces or high production.

Gorton also offers manual and automatic Tracer-Controlled Milling Machines and Pantographs for 2- or 3-dimensional operation; 1 to 1 ratio, or reproduction at variable reductions, with single or multiple-spindle machines for work of any shape or size.

Shown above: Gorton 9-J Super-Speed Vertical Mill with True-Trace hydraulic installation.



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GENERAL ELECTRIC
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To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

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Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

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Progress Is Our Most Important Product

GENERAL ELECTRIC

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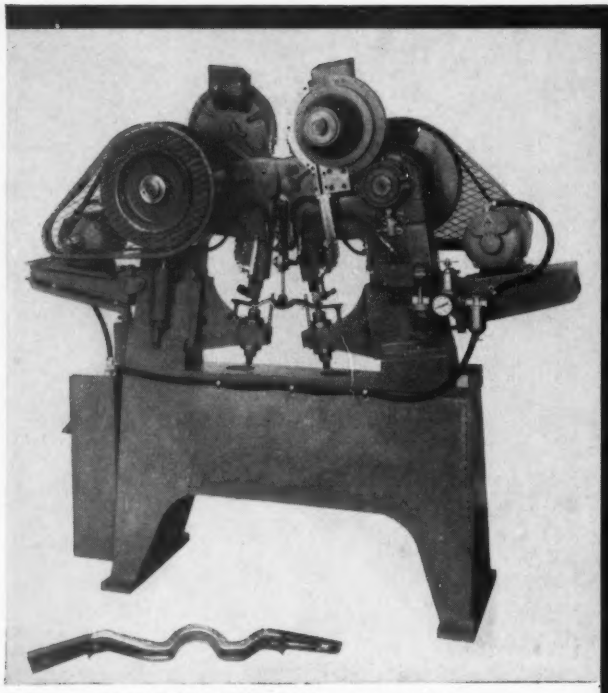
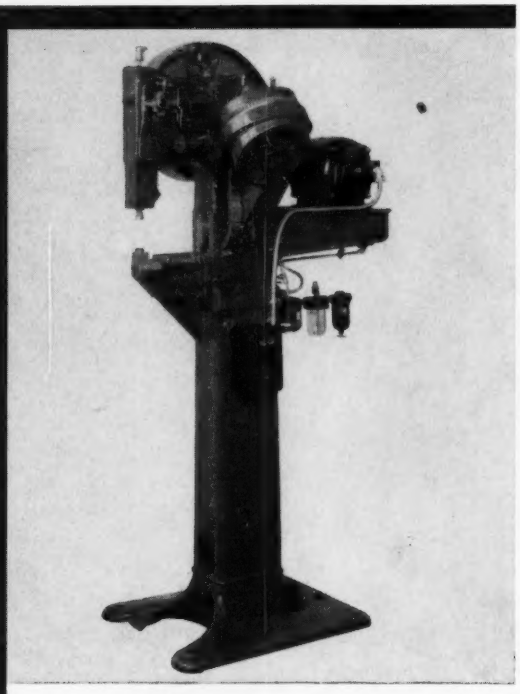
does your riveting and clinching

Faster...Automatically!



This T-J Special Dual Rivitor sets two rivets at a time . . . consists of two 8" throat Model R Rivitors, each with 10" hopper, special oversize anvil post, and special horn. Sample of work shown below machine.

RIVITORS



T-J Clinchors adaptable to a wide range of clinch nut setting problems. Gravity feed model shown here.

CLINCHORS

Automatic feeding and setting with T-J Rivitors and Clinchors help you reduce labor and step up SPEED in a wide range of assembly jobs for aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to 7/8" long. Air-powered sets aluminum alloy rivets or steel rivets up to 3/4" long. Throat depths 8" to 36".

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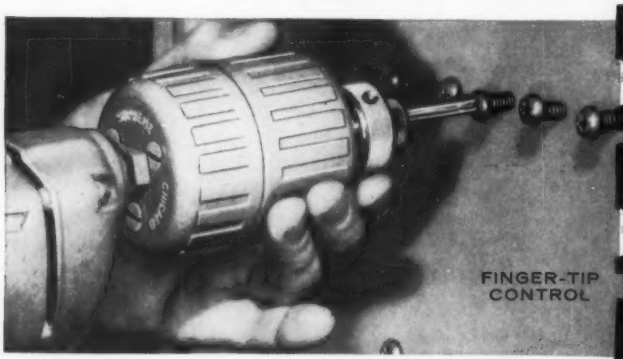

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(*Continued on page 292*)

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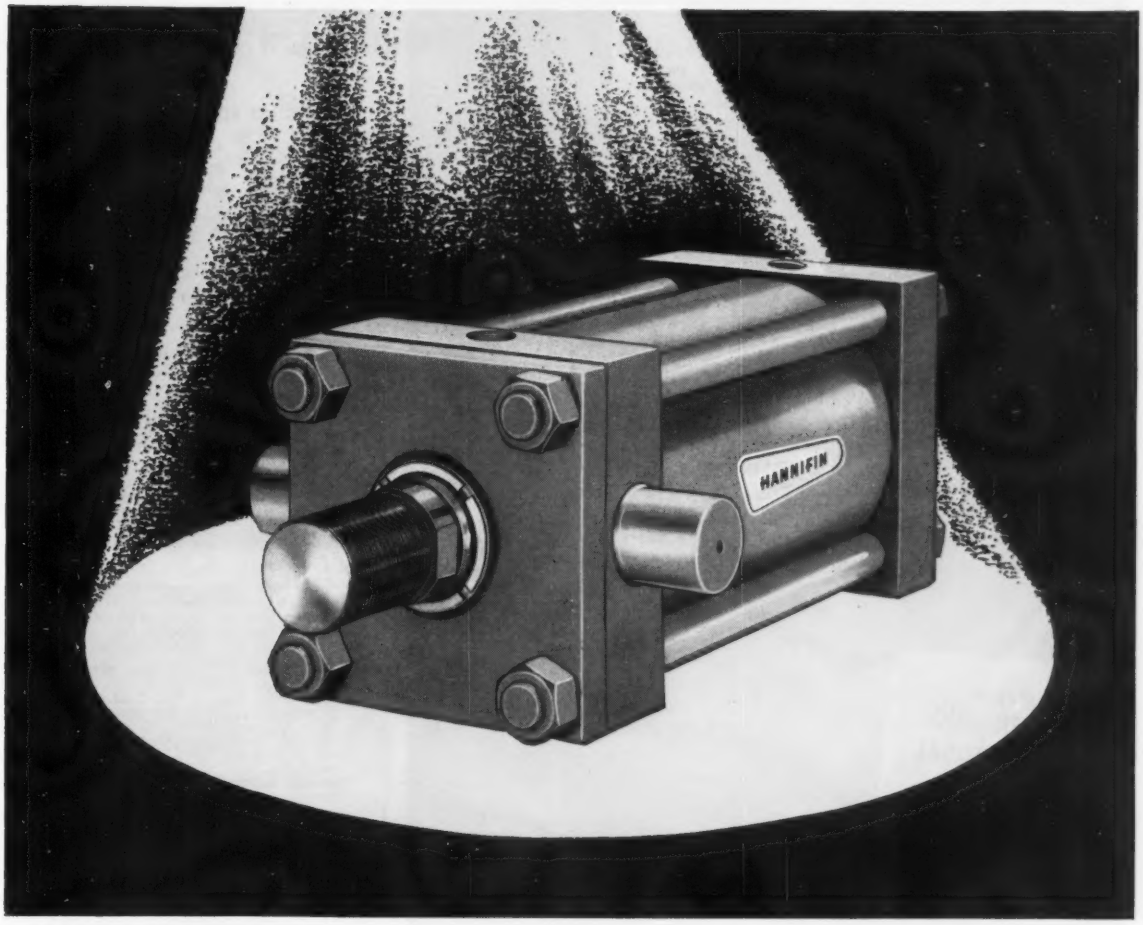

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Let's talk quality. Hannifin manufactures *five* different lines of cylinders. All are made of the finest materials... to the most exacting standards for concentricity and surface finishes...and to proper tolerances for easy, accurate mounting. There are bore sizes and mounting styles to suit every requirement and types of construction to meet every preference.

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Company.....
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Sundstrand Mach. Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Illinois

BALLS
Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Shenango-Penn Mold Co., Dover, Ohio

BARS, Steel
Allegheney Ludlum Steel Corp., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio

BEARINGS, BABBITT
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, New York
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.

BEARINGS, Bronze and Special Alloy
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Shenango-Penn Mold Co., Dover, Ohio

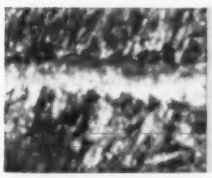
BEARINGS, Lineshaft
Fafnir Bearing Co., New Britain, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

(*Continued on page* 304)

Scratch Test Proves Black Granite Most Durable Surface Plate Material

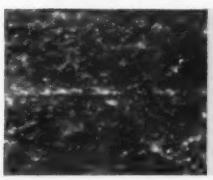
PINK GRANITE

Mica content is readily sliced . . . a poor surface material.



GRAY GRANITE

Here again mica soon causes a poor surface finish.



BLACK GRANITE

Mica so evenly distributed in minute size that the line you see is not a scratch but a smear of metal from the razor blade.

Free 10 Day Trial Offer Allows User to Check for Himself

Here's a test anyone can apply, where you can see the difference.

At the left are three photos, magnified 30 times, of razor scratches in three types of granite used for surface plates. The mark on the black granite is really a "smear" of razor metal, not a scratch in the surface. In the other types of granite, large areas of relatively soft mica give way under the razor edge, so that a definite gouge remains in the surface. Granites containing large areas of mica wear and lose flatness in shorter time.

DoALL Black Granite contains mica but only in very small grains uniformly distributed between the extremely hard feldspar, hornblende and pyroxene elements.

Try a DoALL Black Granite Surface Plate free for 10 days. You'll readily see the difference. Simply fill out and mail the coupon below. Select the size you wish from the list to the left of the coupon. Mail to: ***The DoAll Company, Des Plaines, Ill.***

Ask for the DoALL Black Granite Catalog, today!

DoALL

Des Plaines, Illinois

All types of gaging equipment available through 38 friendly DoALL Sales-Service Stores.

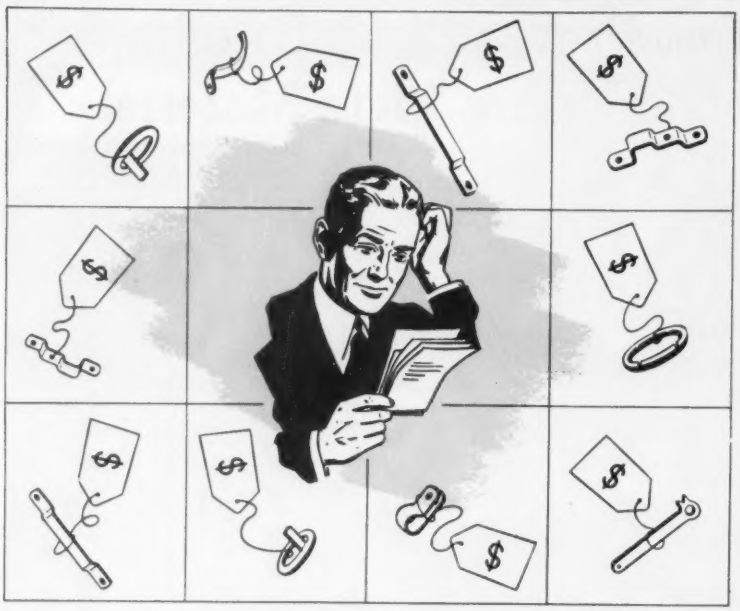
Select any one of these sizes for a free 10 day trial offer:

SIZE	LEDGES
8" x 12" x 2"	none
12" x 18" x 4"	2
12" x 18" x 4"	4
18" x 24" x 4"	2
18" x 24" x 4"	4
24" x 36" x 5"	2
24" x 36" x 6"	4

FREE 10-DAY TRIAL OFFER!

DoALL Company, BG-1
Des Plaines, Illinois

Size_____
Company_____
Address_____
City_____ Zone_____ State_____
Name_____
Title_____



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BEARINGS, Needle
Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self Lubricating (Oilness)
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BEARINGS, Tapered Roller
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Shenango-Penn Mold Co., Dover, Ohio
Timken Roller Bearing Co., Canton, Ohio.

BELT SHIFTERS
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

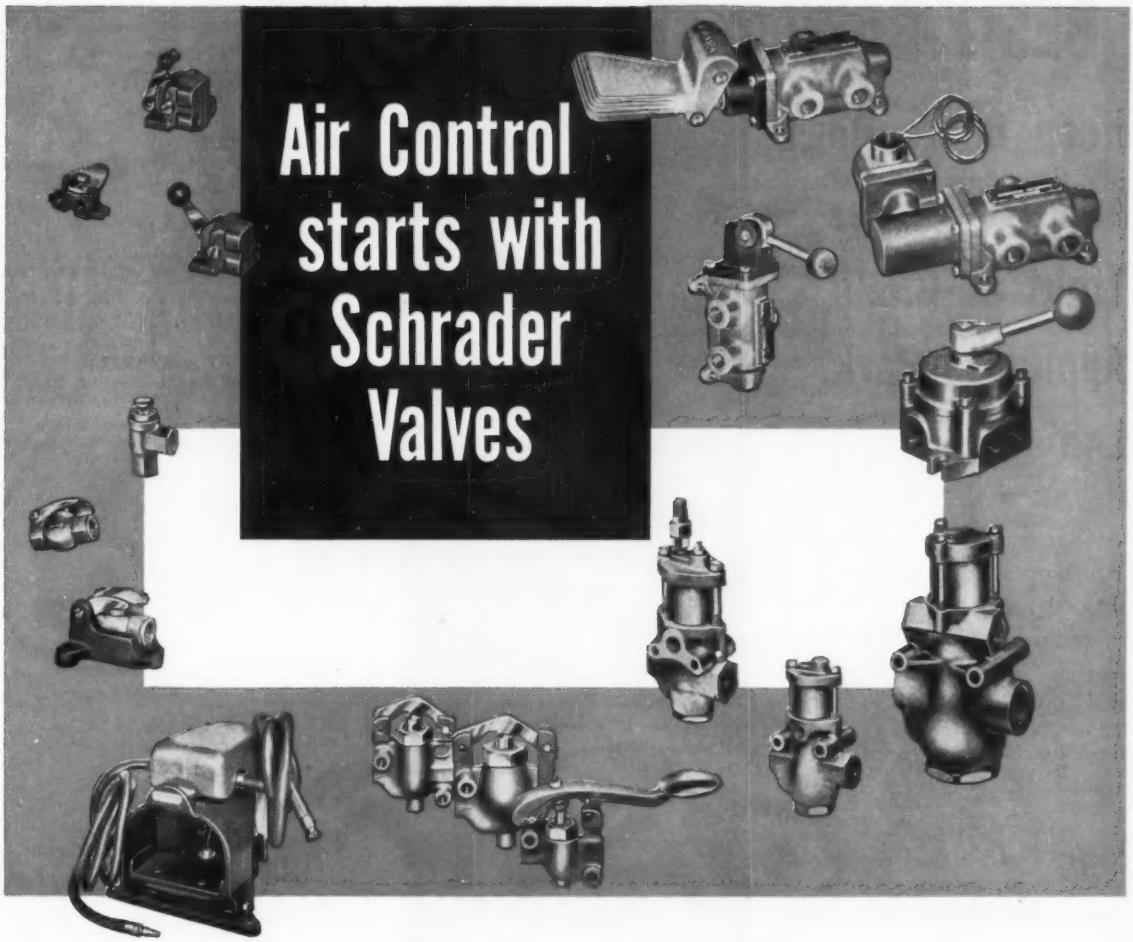
BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 656 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy, Chicago, Ill.

BENDING MACHINES, Pipe
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy, Chicago, Ill.

BLAST CLEANING EQUIPMENT
Modern Ind., Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.,
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

(*Continued on page 296*)



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Compressed air has become a must in every plant. If you are not now using it, investigate it. And—wherever you actually use compressed air—you'll make its use more effective if you use the best valves possible—Schrader Valves. They are designed and built by a company whose success dates back to 1844—more than a century of experience in air control.

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Division of Scovill Manufacturing Company, Incorporated
454 Vanderbilt Ave., Brooklyn 38, N. Y.

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Name_____ Title_____

Company_____

Address_____

For more information fill in page number on Inquiry Card, on page 257

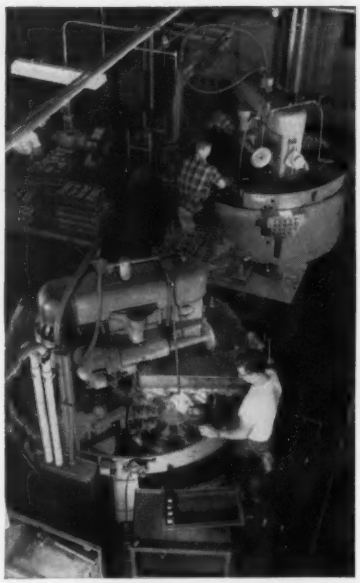
BESLY-BOWEN GRINDERS

Keep Costs Down and Tolerances Tight at G.E.'s Appliance Park, Louisville

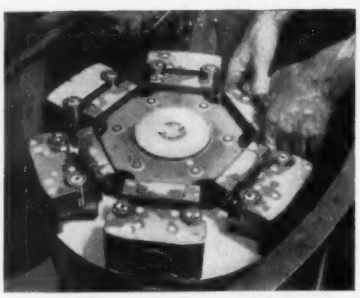
At General Electric's amazing Appliance Park — where all major household appliance manufacturing is centralized—Besly-Bowen Grinders are doing a remarkable job.

The machines pictured at the right — Besly-Bowen 707's and 711's — turn out a variety of parts, including refrigerator compressor pistons and steel compressor cylinder brackets also used in refrigerators. Simple enough to do, with the right equipment, and Besly grinders have come up with the answers. Result: tolerances held to microscopic dimensions, virtually automatic continuous operation with loading and unloading at one station while grinding takes place at the other. All of this adds up to precision parts, ground at high speed and low cost.

On another Besly Double Horizontal Spindle Disc Grinder valve discs used in refrigerators are ground 950 pieces per hour with tolerances held to plus .00015" and *minus zero* — all in a single pass that takes less than 4 seconds!



These Besly-Bowen 711 Radial Head Grinders, equipped with 18" abrasive wheels, finish grind steel compressor cylinder brackets. Picture shows how grinding takes place at one table while the other table is unloaded (grinder at right).



Positioning compressor pistons for finish grinding in a Besly-Bowen 707 Grinder, while grinding takes place at the machine's second table. 400 pieces per hour are ground to .001" for size and .0005" for flatness.

Besly can do as much for you. Write for details or ask to have a Besly Sales Engineer sit in with you.

BESLY

BESLY-WELLES
CORPORATION

Est. as C. H. Besly & Co. 1875
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Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BLUING LAYOUT
Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLT AND NUTS
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

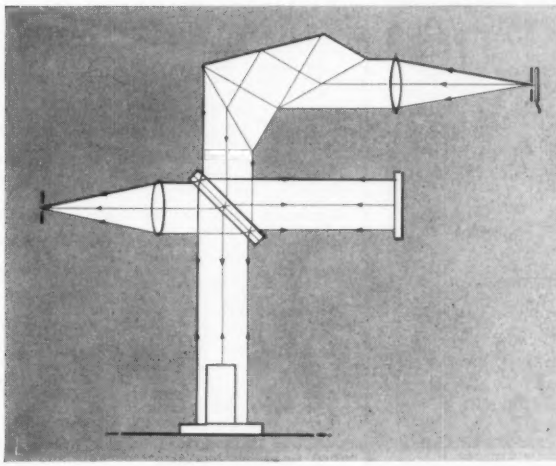
BOOKS, Technical
Industrial Press, 93 Worth St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.
University of Oklahoma Press, Norman, Oklahoma

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Michigan
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

(*Continued on page* 298)

A NEW DIMENSIONAL AUDITING SERVICE FOR INDUSTRY



A Standards Laboratory—America's first commercial dimensional Standards Laboratory has just been dedicated in Dayton by The Sheffield Corporation.

The Eli Whitney Metrology* Laboratory was designed, constructed and equipped in accordance with the experience and standard practices of the great national laboratories of the United States, Great Britain, France and Germany. Thus, this new "Bureau of Standards" is qualified to supplement the work of the governmental laboratories in calibrating and certifying dimensional standards for industry.

Here, also, dimensional audits of precision mechanical components are made—audits not practicable except with the equipment and under the unmatched accurately controlled environment of this Standards Laboratory.

Here, overall dimensional control programs are developed for individual manufacturers—gage surveillance operations worked out in detail.

Here, key personnel responsible for dimensional control can study the philosophy of high precision—can get the feel of high precision equipment and become familiar with the procedures involved.

As to the Laboratory's name—what could be more fitting than to honor that illustrious pioneer, Eli Whitney?

It was Eli Whitney who taught the world the practical value of consistent dimensional precision as the essential of interchangeable parts manufacture.

It was Eli Whitney who thereby introduced our modern era of mass production and economic abundance.

It was Eli Whitney's achievements which demonstrated the blood relationship between dimensional precision and product quality.

The Eli Whitney Metrology Laboratory now takes its place as industry's ally in carrying on this tradition.

For a more comprehensive account of the facilities and capabilities of this unique Laboratory, write for Bulletin ML 1-56. Dept. 9.

Metrology—The science of measurement.

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ACCO products

Wilson "Rockwell"* Hardness Testers

Is HARDNESS an important factor in your business?

• If your business involves metals, successful operation often requires *exact* knowledge of the proper hardness of the materials you make or work with.

In heat treating departments

WILSON "ROCKWELL" testing of hardened and tempered steels is universal.

In metallurgical laboratories

They provide means for establishing thousands of hardness specifications.

In the tool room

They are relied upon for absolute guidance as to the hardness of tools and the metals to which they are applied.

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Inspection of parts to see that they actually meet specifications is an important use of WILSON "ROCKWELL" hardness testers. On the inspection line they help insure the quality of the product, reduce defects, and retain the good name and reputation of the manufacturer.

In the production department

WILSON "ROCKWELL" hardness testers are ideal for use in production testing. The test, complete from work insertion, loading procedure, feeding, removal of work piece—is a matter of three to five seconds depending on the skill and dexterity of the operator.

• For complete information on "WILSON ROCKWELL" Hardness Testers call or write today. There is a WILSON model to meet every testing requirement.

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WILSON "ROCKWELL"
the world's standard of hardness accuracy

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

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Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mach. Co., 2442 Douglas St., Rockford, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Cincinnati, Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R. Evanston, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Innocenti Corp., 43 W. 61st St., New York 23, N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Bryant Chucking Grinder Co., Springfield, Vt.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bon St., Worcester 6, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Wadell Equipment Co., 119 So. Ave., Garwood, N. J.

(*Continued on page 300*)

News from Hamilton!

100 to 300 ton press line sets new standards

Here's Hamilton's brand new high-speed 250-ton, double-crank press with 60" x 36" bed and slide

For the first time in the industry, Hamilton gives you 100 to 300 ton presses built to meet exacting automotive production standards . . . standards pioneered in the automotive field through more than thirty years of Hamilton press leadership.

Every one of these 2-point, single acting, straight-side, double-crank presses is a brand new design. Each is engineered for constant top-speed, top-quality production—without profit-robbing downtime. Each is built for complete operating flexibility. Here are just a few of Hamilton's built-in extras that mean more operating profit for *you:*

- rugged welded steel construction
- mechanically interlocked air clutch and brake
- barrel-type motorized slide adjustment
- automatic lubrication
- pneumatic flywheel brake
- die lights
- die cushions
- pneumatic counterbalances
- interlocked electrical clutch control

Exact specifications are adjustable to your individual requirements. Special electrical controls are available to meet particular electrical standards.

It will mean money in your pocket to find out today how these all-new Hamilton presses can help you turn out high quality stampings fast . . . without costly production downtime. Get the full story on these new standards for 100 to 300 ton presses . . . from Hamilton Division, BLH Corporation, Hamilton, Ohio.

BALDWIN BLH LIMA-HAMILTON

HAMILTON DIVISION
BALDWIN-LIMA-HAMILTON
DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

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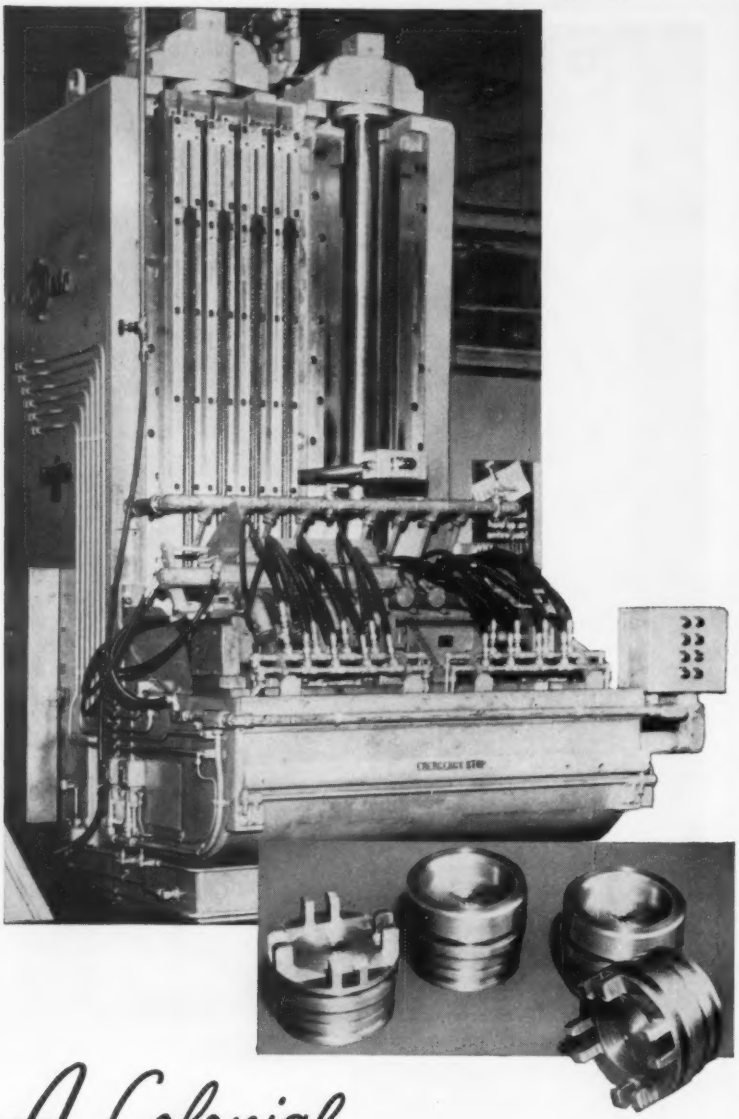

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UNIFIED BROACHING INSTALLATION

- 480 parts per hour
- 2 passes per part
- 90° index between passes
- Automatic broaching cycle
- 168 pounds of metal broached per hour
- Automatic chip removal
- Colonial dual ram 15-ton 66-inch stroke
- Ask for Colonial dual ram bulletin RT-54

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American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown Ohio.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bliss, E. W., Co., 1375 Raff Road, S. W. Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

BRASS

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

BROACHES

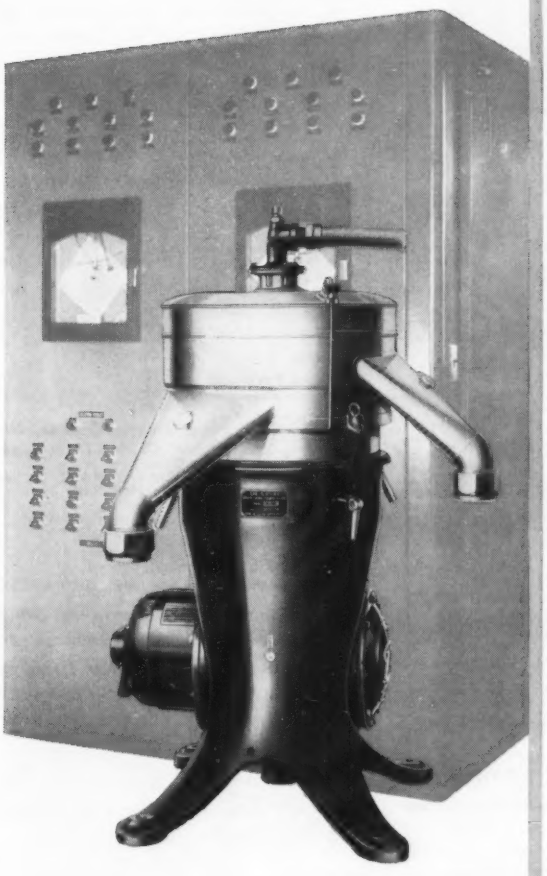
American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Detroit Broach Co., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Detroit Broach Co., P. O. Box 156, Rochester, Mich.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.

(*Continued on page 302*)

AUTOMATION imposes new high standards on cutting oils!...



And DE LAVAL keeps your oil up to those standards!

With automation . . . it's more important than ever to keep cutting oil free of grit and metallic particles.

Because with automation, the greatly increased cost of down-time for tool replacement makes it vital to minimize replacement frequency.

De Laval Centrifugal Cutting Oil Purifiers increase tool life tremendously . . . prevent excessive wear . . . give you longer machine runs . . . cut costs!

Whether your plant is converted to automation or just considering it . . . De Laval Cutting Oil Purifiers can make the big difference in your profit picture!

DE LAVAL
Purifiers and Clarifiers for Factory Oils

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 201 E. Millbrae Ave., Millbrae, Calif.

For more information fill in page number on Inquiry Card, on page 257

More Pieces COMPLETELY *finished in less time on* GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & De Leeuw feature provides for finish machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

Send for illustrated literature which fully describes this recent Goss & De Leeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
Zagar Tool Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE
American Brass Co., Waterbury 20, Conn.
Bridgeport Brass Co., Bridgeport, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

BUFFERS
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BURS
See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Kennametal, Inc., Latrobe, Pa.
Shenango-Penn Mold Co., Dover, Ohio

BUSHINGS, Hardened
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1925 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig
Colonial Bushings, Inc., 31780 Groesbeck Hwy. Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

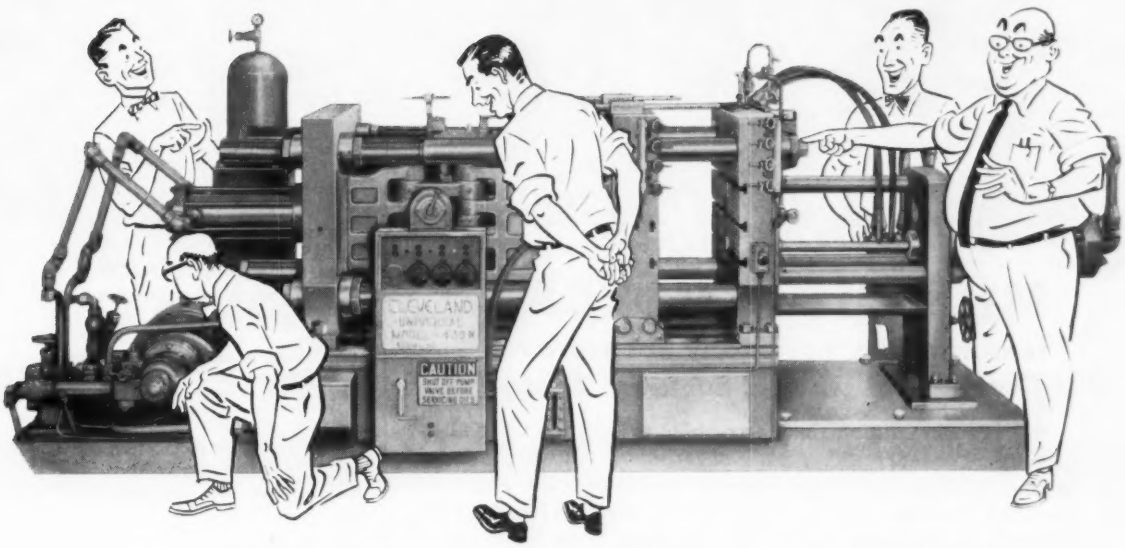
CALIPERS
Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

CAM CUTTING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sundstrand Machine Tool Co., 2351 11th St., Rockford, Ill.

(*Continued on page* 304)

WELL WORTH LOOKING INTO!

Cleveland Model 400-N shown with cold chamber end. Weight of metal per shot, including gate: 7.2 lbs., aluminum; 14.5 lbs., zinc.



New CLEVELAND model 400-N

Hydraulic Universal Die Casting Machine

Write for new Bulletin

From every angle, the new Cleveland Model 400-N has every feature you're looking for to give you better castings, faster, at less cost!

Here is a massively constructed, rugged, powerful machine. It locks dies at better than 400 tons pressure, *strain gauge tested*. Its faster die closing and opening speed will give you more shots per hour. Its rapid injection speed guarantees production of sound, dense, hardware-finish castings. Further, Cleveland's time-tested design and quality construction assure dependable, around-the-clock operation with machine maintenance at a minimum level.

Look into the new Cleveland Model 400-N, from every angle. You'll quickly discover why leading die casters call it the outstanding machine buy in its capacity range. Call in a Cleveland sales engineer for complete information and send for the new Model 400-N Bulletin.

REMEMBER, CLEVELANDS CUT COSTS

THE CLEVELAND AUTOMATIC MACHINE COMPANY

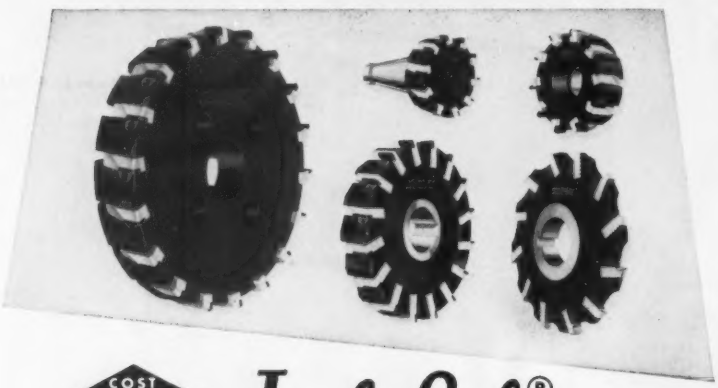
4936 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information fill in page number on Inquiry Card, on page 257

McCROSKY



COST CUTTING TOOLS

Jack-Lock® MILLING CUTTERS

featuring the nationally shop-proved *Jack-Lock*® Blade Locking Wedge

• McCrosky Milling Cutters combine the rigidity of solid tools with the longer life, greater economy, and lower cost of inserted blade design. They match the speed, feeds and power potential of modern milling machines. The powerful Jack-Lock wedges lock the blades rigidly and accurately in the body. No hammering or pounding on a drift. Blades can be locked while positioned against an indicator. Consequently a minimum of blade stock is lost in regrinding — reducing sharpening time and prolonging blade life. Get full details about the complete line! *Write for a bulletin today!*

WRITE FOR THE McCROSKY BULLETINS
. . . Send the coupon today!

McCROSKY TOOL CORPORATION
1353 Main Street
Meadville, Penna.

COST CUTTING TOOLS

Gentlemen:

Please send Bulletins describing the tools checked below.

☐ *Jack-Lock*® MILLING CUTTERS
☐ *Block-Type* BORING BARS
☐ *Super*® *Adjustable* REAMERS
☐ *Turret* TOOL POSTS
☐ *Wizard*® QUICK-CHANGE CHUCKS
☐ *Specially Engineered* MULTIPLE PRODUCTION TOOLS

Name_____ Title_____

Company_____

Address_____

CAM MILLING AND GRINDING MACHINES

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Machry. Co., 287 Homestead Aves., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Mueller Brass Co., Port Huron 35, Mich.
Shenango-Penn Mold Co., Dover, Ohio

CASTINGS, DIE

American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Shenango-Penn Mold Co., Dover, Ohio

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

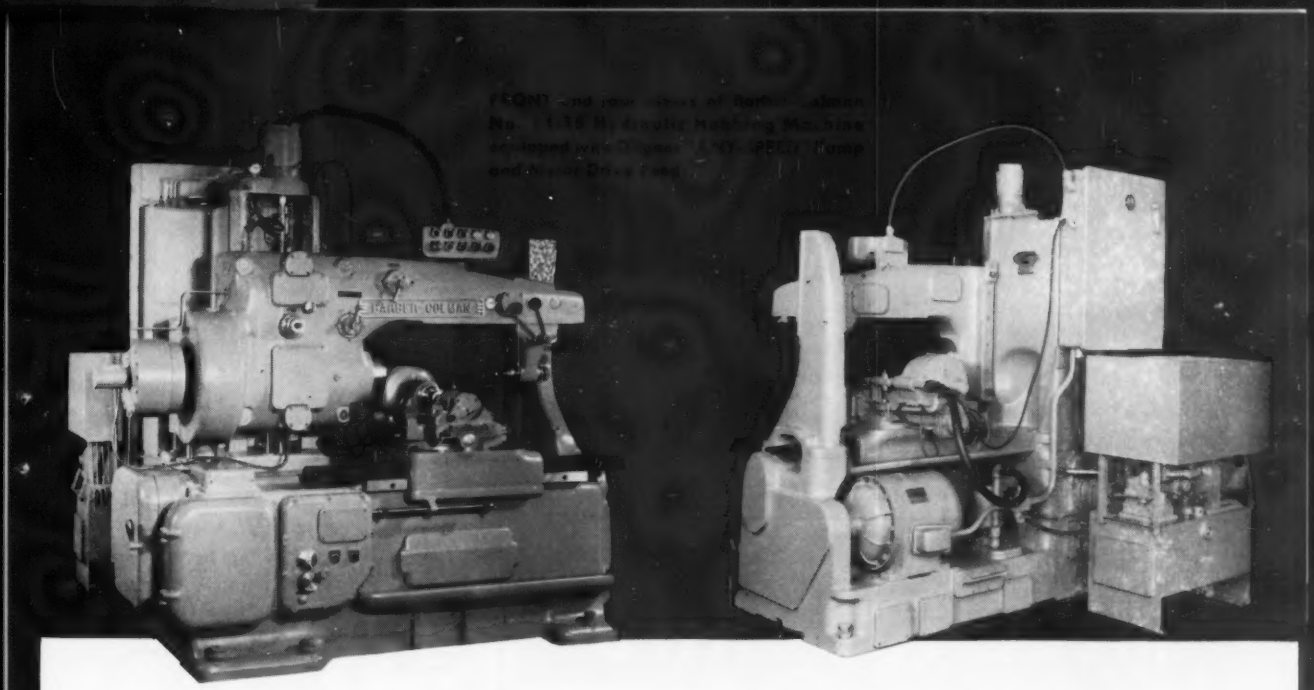
CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

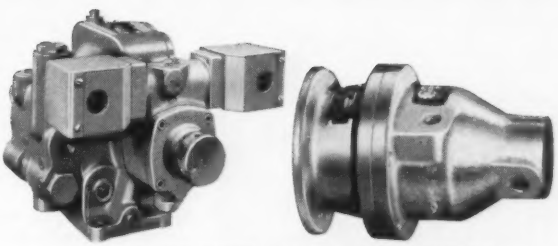
(*Continued on page* 306)



ANOTHER TRIUMPH IN MACHINE DESIGN THAT USES OILGEAR "ANY-SPEED" DRIVE FEEDS

Barber-Colman's new high-speed hobbing machine may be totally different from the machines you build. But the machine design problems they encountered in developing this machine could very well be your problems. Among the problems encountered was that of feed. To solve this problem, Barber-Colman selected Oilgear Fluid Power Feeds. These feeds give them the infinitely variable output to provide a hobbing feed range of .020" to 1" per minute. In addition, they provide a far more constant hobbing feed despite changes in load or system temperatures. They also provide cushioned, positive, precise, fast-acting electro-hydraulic control of feed, rapid traverse, and stop through automatic switches. Finally, they provide power for operating ten auxiliary cylinders and three valves. One Oilgear type AX-311 Pump supplies fluid power for the entire machine.

You have much to gain if you stop a moment and ask: "Why are leading machine and machine tool builders turning to Oilgear? Am *I* missing an opportunity to improve machine performance?" Why don't you compare your machine needs with what Oilgear "ANY-SPEED" Drives and Feeds can provide? You can rest assured that we will recommend our product only when it is to your advantage. Tell us your needs. We'll give you a specific appraisal of the possibilities. Write now. THE OILGEAR COMPANY, 1569 W. Pierce Street, Milwaukee 4, Wisconsin.



Type AX-311 PUMP and Type H-311 MOTOR
OILGEAR "ANY-SPEED" DRIVE FEED

OILGEAR
Fluid Power

PIONEERS . . . NOW THREE PLANTS FOR FLUID POWER

PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS & VALVES

CENTERS, Lathe
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHAINS, Power Transmission and Conveyor
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS
Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baroons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Single and Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter and Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 83, Ohio.

CHUCKS, Air Operated
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split
See Collets

CHUCKS, Diaphragm
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Supreme Products, Inc., 2222 So. Calumet Ave., Chicago 16, Ill.

CHUCKS, Full Floating
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Gear
Gleason Works, 1000 University Ave., Rochester, N. Y.
Horton Chuck, Windsor Locks, Conn.
Supreme Products, Inc., 2222 So. Calumet Ave., Chicago 16, Ill.

CHUCKS, Lathes, etc.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Horton Chuck, Windsor Locks, Conn.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(*Continued on page* 308)

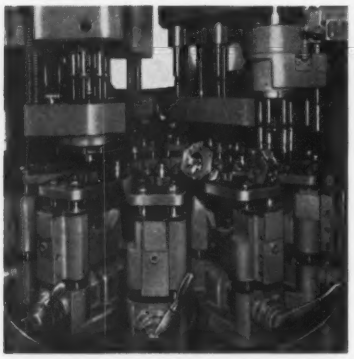
MILLHOLLAND

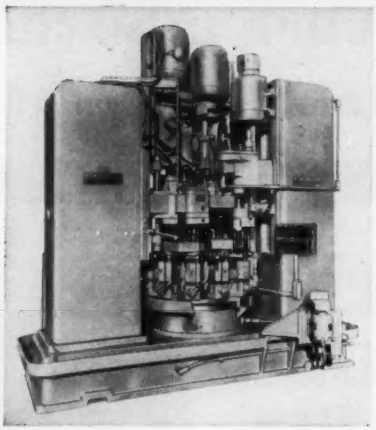
12-Station Vertical Indexing Machine

34 Spindles!

93 Pieces per Hour!

Here is Millholland versatility in action!





Lead Screw Tapper with reversing motor drives a 6-spindle tapping head. All machine elements are electrically synchronized, with push-button control for "cycle start," automatic single cycle, set-up and emergency stop. Chip disposal is simplified with wiper blades rotating within a ring on the index table to bring chips to a removable pan.

Unique Holding Fixture

With a 31-second cycle time, this machine produces 93 pieces per hour at 80% efficiency! This chip cutting efficiency is made possible by the distinctive design of the plate type cam used in Millholland Automatic Units, plus the action of the pneumatic counterbalance.

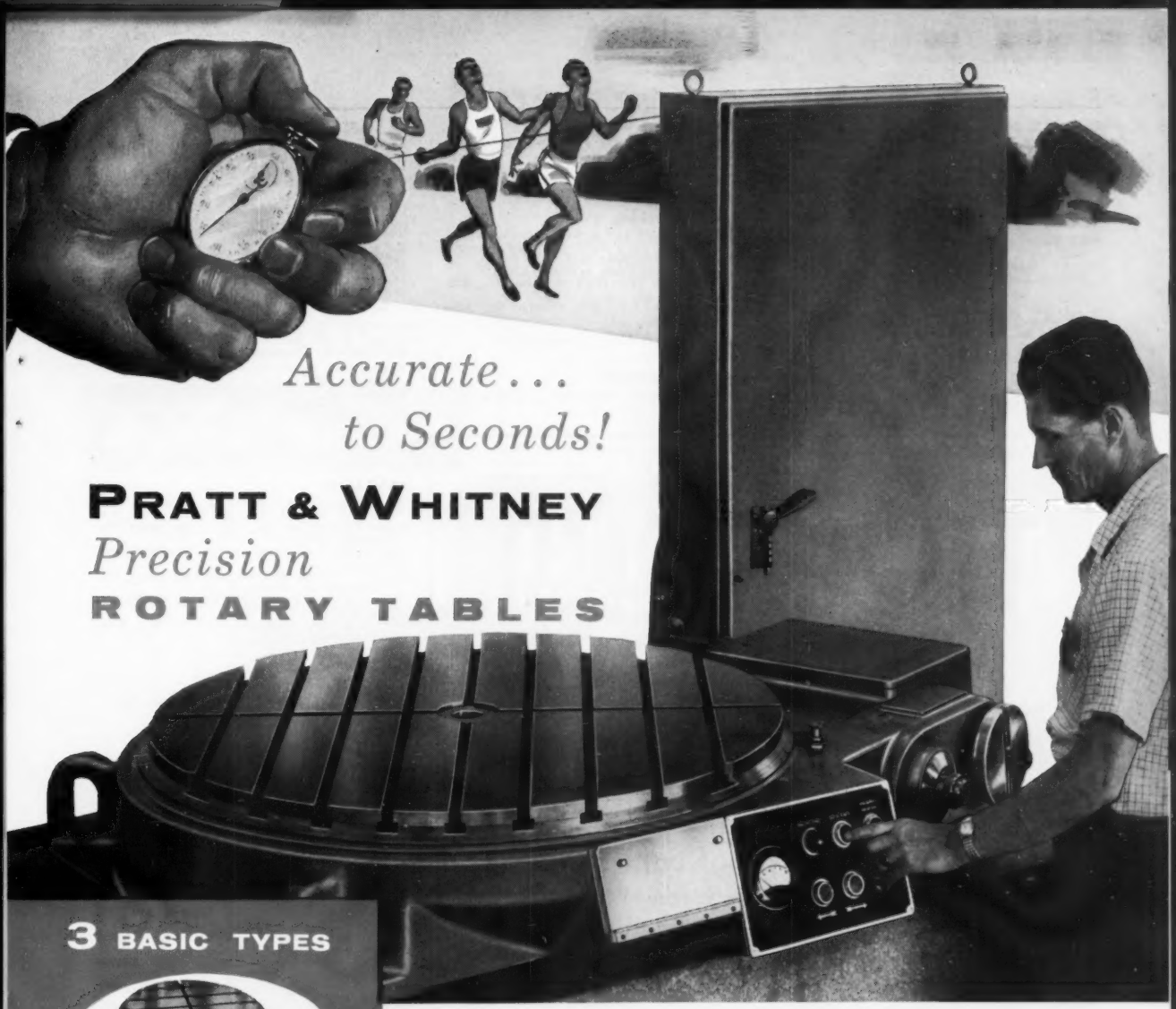
Two No. 5 Units are mounted vertically, the first with 22 spindles, the second with 5; a No. 2 unit is mounted horizontally on a rapid travel slide, and an Automatic

Part requirements dictated location using self-centering horizontal vees with up-acting clamps, actuated by a single handle operating through a small arc. Fixtures also contain register pins for all bushing plates. The 12 fixtures are mounted on an independently powered automatic index table with self-contained lubrication pump.

A complex production problem, solved efficiently with Millholland equipment and Millholland know-how.

Write for Bulletin M-4 giving further details.

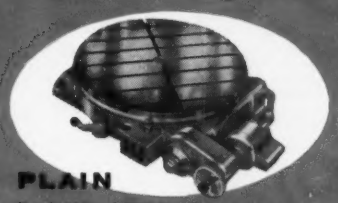
W. K. MILLHOLLAND MACHINERY CO.
6402 Westfield Blvd. Indianapolis 20, Indiana



Accurate . . .
to Seconds!

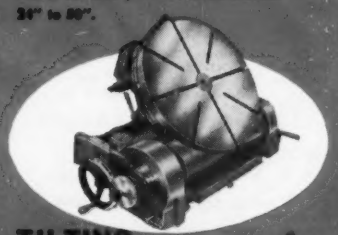
PRATT & WHITNEY
Precision
ROTARY TABLES

3 BASIC TYPES



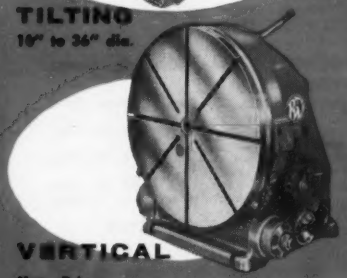
PLAIN

Hand: 12" and 20" dia. Motor-Driven: 24" to 80".



TILTING

18" to 36" dia.



VERTICAL

Motor-Driven: 30" and 48" dia.

Like the timer's stop watch, Pratt & Whitney Rotary Tables are *accurate to seconds* . . . seconds of arc, that is! And they're built for ruggedness and stamina too. They'll help you eliminate expensive jigs and set-up changes on difficult, precise machining jobs year after year. Ideal, too, for reliable inspection and circular indexing.

Featured here is the latest in this advanced line . . . the new 42" Plain Rotary Tables WITH AUTOMATIC INDEXING. Work is automatically positioned to any desired angle by means of easily set dogs. Initial *and* repeat settings are made with the same dependably high accuracy.

Now . . . Pratt & Whitney Rotary Tables can also be furnished with indexing control by **numerical data.**

WRITE FOR COMPLETE INFORMATION . . . ask for illustrated circulars fully describing P&W Precision Rotary Tables.

PRATT & WHITNEY COMPANY
INCORPORATED

12 Charter Oak Boulevard, West Hartford, Connecticut

Direct Factory Representatives in Principal Cities

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CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Buck Tool Co., 220 Schippers Lane, Kalamazoo, Mich.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

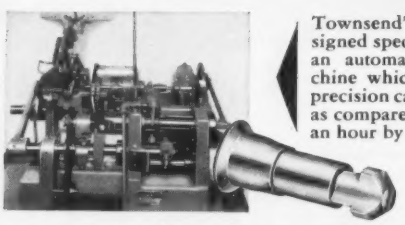
CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

TOWNSEND OF HARTFORD

QUALI-MATIC MACHINES

Townsend develops machines to *mass produce* a NEW *vibration-proof* cam-stud *within .001 tolerances* for the Aviation Industry!



Townsend's engineers designed special camshafts for an automatic milling machine which produces 720 precision cam studs an hour, as compared to less than 60 an hour by another method.

The problem of how to mass produce within .001 tolerance a special vibration-proof cam stud to meet the exacting specifications of the aircraft industry, was given to Townsend of Hartford to solve. We accepted the challenge, solved the problem and produced the machine to do the job.

This is but one of many problems Townsend has worked on and successfully solved during our 55 years in business. Townsend of Hartford has the engineering and manufacturing experience and skill to create automatic precision secondary operation machines for all fields of mass production, no matter how specialized the operation.

The H. P. TOWNSEND MANUFACTURING CO.
ELMWOOD, CONNECTICUT

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Sterrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
International Chemical Co., 2628 N. Mascher St., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
International Chemical Co., 2628 N. Mascher St., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
International Chemical Co., 2628 N. Mascher St., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).

(*Continued on page* 310)

Another Example of

VICKERS®

HYDRAULICS

in Automation

Ex-Cell-O Precision Cylinder Boring Machines shown below are finish-boring V-8 engine blocks. Like so many other high-production machines, these make generous use of hydraulics.

In addition to the advantages inherent in hydraulic control, Vickers Hydraulics gives you the benefits of a nation-wide company-operated field engineering and service organization to assure correct application and operation with least maintenance. Vickers has the complete line of hydraulic equipment necessary to take undivided system responsibility . . . to eliminate any risk of incompatibility of hydraulic components.

The Vickers Application Engineer near you will be glad to demonstrate the many benefits you can obtain by using Vickers Hydraulics. Write for a copy of Catalog 5002B.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION
ADMINISTRATIVE and ENGINEERING CENTER
Department 1403 ● Detroit 32, Michigan

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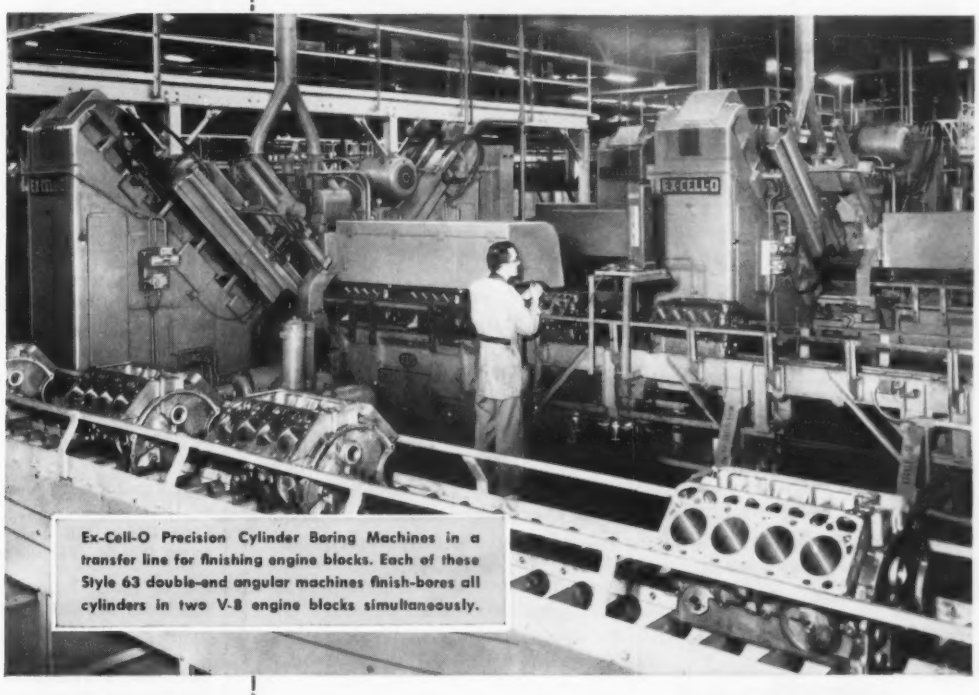
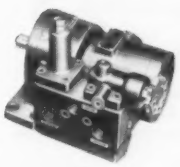
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

Engineers and Builders of Oil Hydraulic Equipment Since 1921



Ex-Cell-O Precision Cylinder Boring Machines in a transfer line for finishing engine blocks. Each of these Style 63 double-end angular machines finish-bores all cylinders in two V-8 engine blocks simultaneously.

Representative VICKERS® Units Used on Ex-Cell-O Precision Cylinder Boring Machines

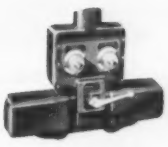


Two-Pressure Pump

Insures lower maintenance cost and saves horsepower and heat in two-pressure hydraulic circuit. Automatically provides high volume at low pressure and low volume at high pressure.

Solenoid Controlled Pilot Operated 4-Way Valve

Compact and versatile "sandwich" construction. Gasket mounting simplifies installation and overhaul . . . also minimizes piping.

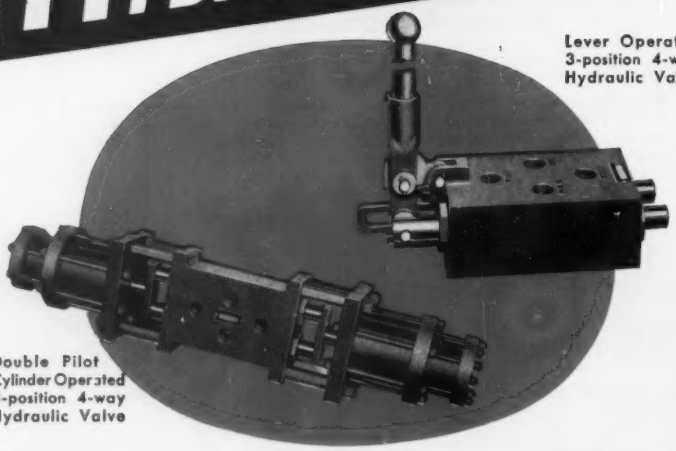


Traverse and Feed Cycle Control Panel

Maintains smooth and constant preset feed rate regardless of fluctuations in cutting tool resistance or hydraulic pressure.

7350

Quick-As-Wink® HYDRAULIC VALVES



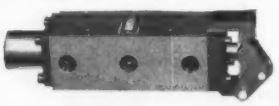
Lever Operated 3-position 4-way Hydraulic Valve

Double Pilot Cylinder Operated 3-position 4-way Hydraulic Valve

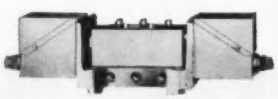
Hand and Pilot-operated Types for Water or Hydraulic Oils to 5000 psi.

• Quick-As-Wink Hydraulic Control Valves meet the most exacting requirements. These valves are fully balanced in any position. Patented design includes hydraulically balanced U-packers. Packers are floated while crossing the valving ports, thus assuring long life, and expanded by internal valve pressure to provide a tight seal. Maintenance is extremely low and usually can be done quickly in the field, avoiding the delay of returning valves to the factory for servicing, or the need of maintaining large standby inventories. For long, dependable, trouble-free service, specify Quick-As-Wink Hydraulic Valves. Write for Bulletin No. 531 and the fully descriptive Data Sheets. They give complete details. Write *today!*

Ask us also about . . .



CAM OPERATED SINGLE PLUNGER VALVE ⅜" to ¾" sizes. Operated by rotating cam or land on reciprocating device.



DOUBLE SOLENOID "O-TYPE" VALVE for pressures up to 125 psi. Widely used as pilot valves and for operating air cylinders.

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

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Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
White & Bagley Co., Worcester, Mass.

COMPOUNDS, Resin and Molding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Fellows Gear Shaper Co., Springfield, Vt.
Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett, Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

COOLANT SEPARATORS

See Separators, Oil or Coolant

COOLANT SYSTEMS

Gray-Mills Co., 1948-52 Ridge Ave., Evanston, Ill.

COPPER

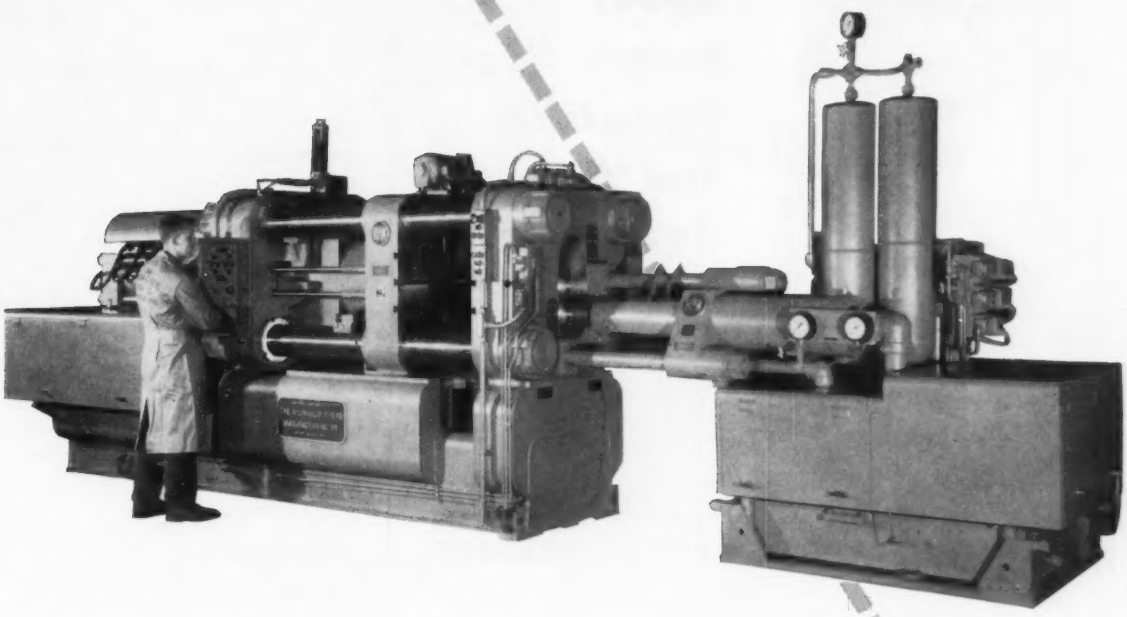
American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

COUNTERBORES

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(*Continued on page* 312)

THE INCOMPARABLE H-P-M DIE CASTER



First Completely New Die Casting Machine In 15 Years

This new machine is the answer to many of today's die casting problems . . . cleaner castings . . . negligible scrap . . . better dimensional control with production output to meet any job requirement. It's time proved through four years of development with one year acceptance in the field.

H-P-M's all new hydraulic-mechanical link wedge clamp and new design injection end result in a brand new approach to die casting technique. Accurate closing of mold eliminates excessive flash. The new clamp has plenty of "beef"—clamp locks mold firmly to at least the rated tonnage and "beef" limits die parting on overload during metal injection. The new injection end has unlimited motion control . . . exceptionally high speed. Get the complete story on this new H-P-M before you buy. You'll be glad you did.

Write today for complete specifications for the new H-P-M die casting machines. Available in a range of sizes from 200 to 1500 ton capacities.

DIE CASTING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM

OUTSTANDING!

Never Before Such Versatility and Accuracy Available in its Price Range!

K. R. WILSON'S NEW FOUR COLUMN DOWN-ACTING HYDRAULIC PRESSES

Here's the Guided Platen Press that's setting new standards in efficiency, low cost metal forming and drawing, plastics and rubber molding, laminating, die cutting, assembling, die tryout, pressing and many other applications that require precise control of an accurately guided platen. Here are the details:

A standard line of 25-200 tons capacity four column presses built to accuracy heretofore obtainable only from costly custom-built presses. Platens are align-bored to optically controlled tolerances.

Operational Features: variable pressure • adjustable stroke • adjustable daylight • wide range of speeds • fast traverse with slow pressing • variable speed • manual, semi-automatic and full automatic controls.

Design Features:

- PLATENS ARE ALIGN-BORED for greater accuracy.
- EXTRA-LONG PLATEN GUIDES have renewable bronze bushings and lubricating fittings.
- POLISHED AND GROUND COLUMNS resist wear and increase accuracy of platen travel.
- MAXIMUM STROKE SAFETY LIMIT CONTROL prevents damage to dies or press due to over-travel of platen.
- COMPACT, SELF-CONTAINED PUMPING UNITS insure dependable, trouble-free service.
- CUSTOM ACCURACY, custom quality at standard line prices.

Get full details and complete specifications. Write for Bulletin No. 95.

HYDRAULICS DIVISION

K·R·WILSON·Inc.

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Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

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Boston Gear Works 3200 Main St., North Quincy, Mass.
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Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

CUTTER GRINDERS

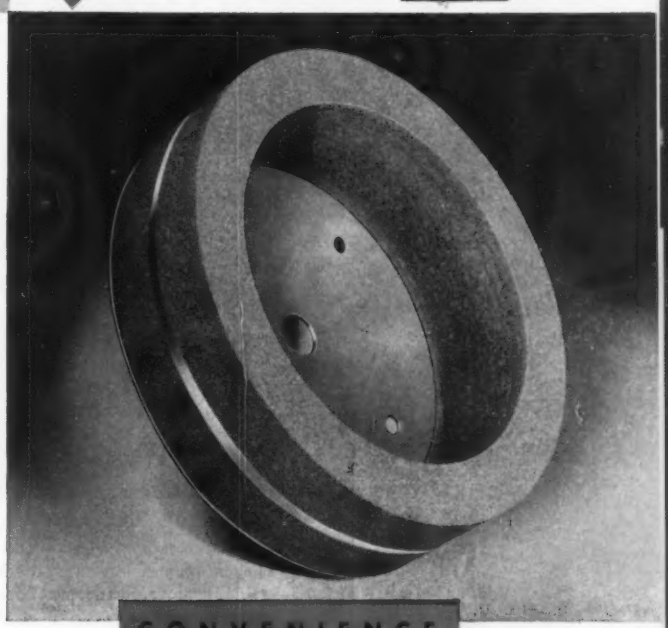
See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

(*Continued on page* 314)

ECONOMY

two efficient ways

to solve the same problem !



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STERLING EASYMOUNT and PLATE MOUNTED WHEELS

provide equal winning performance for carbide tool grinding

● For faster, expert carbide tool grinding, folks find record-breaking performance every time from the Sterling Twins—the Easymount or Plate-Mounted Wheel.

You cannot go wrong on either choice of abrasive tools. Many choose the Easymount for economy and others like the Plate-Mounted Wheel for its convenience. Both provide economical, more precise grinding of carbides every time.

Ask for a trial of either the Easymount or Plate-Mounted Wheel—or both! Sterling engineers will gladly show you how quickly either Sterling unit pays for itself.

"THE WHEELS OF INDUSTRY" STERLING ABRASIVES

STERLING GRINDING WHEEL CO., TIFFIN, OHIO

A SUBSIDIARY OF

ABRASIVE AND METAL PRODUCTS CO.

A&MP

DISTRIBUTORS IN ALL PRINCIPAL CITIES

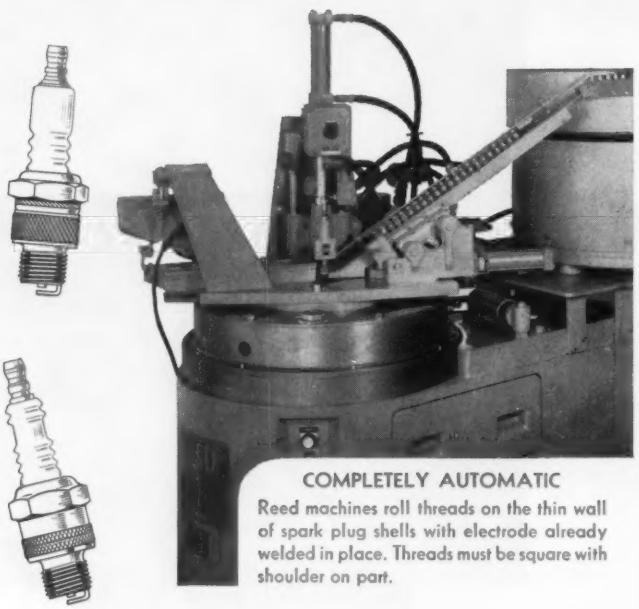
REED

All the Foremost Spark Plugs

Have Threads

Rolled Exclusively on

REED MACHINES



COMPLETELY AUTOMATIC

Reed machines roll threads on the thin wall of spark plug shells with electrode already welded in place. Threads must be square with shoulder on part.

Rolled threads are superior. They are uniformly accurate, smooth and stronger—also more economical to produce.

Reed machines, used for both thread and form rolling, are made in 2 die horizontal and 3 die vertical types for in-feed or thru-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Equipped for manual, semiautomatic or fully automatic feeding, Reed machines are suitable for both small job lots and large production runs.

Write for Thread and Form Rolling Bulletin

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

187

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Twist Drill & Tl. Co., Rochester, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Motch & Merryweather Mchry Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tl Co., Rochester, Mich.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Wesson Co. 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y

(*Continued on page* 316)

Announcing...

K7H

NEW KENNAMETAL* GRADE FOR HIGH VELOCITY MACHINING

Grade K7H is the hardest Kennametal ever offered for steel cutting . . . 93.5 Rockwell A. This high hardness, combined with exceptional strength—even at higher temperatures—provides a long-wearing, "balanced" cutting edge for high velocity machining at light to moderate feeds.

K7H was developed after months of cooperation with machine builders to match ever-increasing spindle speeds with the best possible cutting material for finishing operations. It is especially suited for facing, profiling, turning and boring steel alloys, high-tensile steels and "hard-to-machine" jet engine materials such as Inconel, 400-series stainless and nickel base alloys.

In tests on high-tensile steel, operating at ⅔ higher speed and 50% heavier feed, Kennametal Grade K7H consistently shows two to three times more life than the many other carbides and cutting materials that were tested.

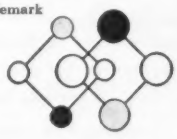
K7H is only available in Kendex throw-away type inserts. Why not have a Kennametal tool engineer help you take full advantage of this remarkable new grade. Call him today or write, KENNAMETAL INC., Latrobe, Pennsylvania.

CHARACTERISTICS OF GRADE K7H

- High wear-resistance
- Maximum crater-resistance
- High strength in relation to hardness
- Retains strength at higher temperatures
- Ideal for high velocity cutting

Remember,
it's a Carbide . . .
it's Kennametal . . .
it's available now

*Registered trademark



INDUSTRY AND
KENNAMETAL
...Partners in Progress

B-5010

MARVEL Synclinal FILTERS

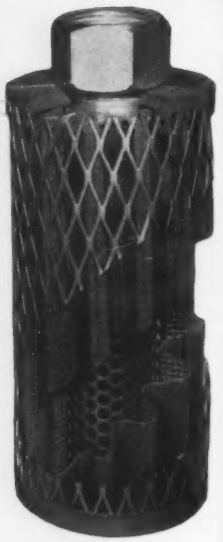
For Efficient Filtration of--

Hydraulic Oils

Fire Resistant Hydraulic Fluids

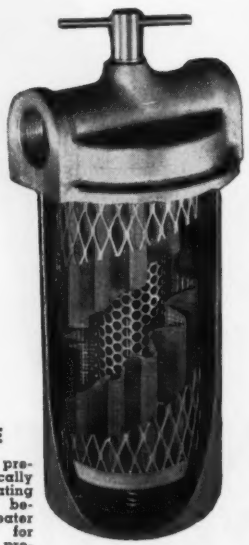
Coolants – Lubricants

Water



SUMP TYPE (cutaway)

OVER 650 Original Equipment Manufacturers Synclinal Filters Install Marvel as Standard Equipment



LINE TYPE (cutaway)

PROTECT EQUIPMENT— INCREASE PRODUCTION— REDUCE MAINTENANCE

Marvel Synclinal Filters installed in the sump or on the line preceding pump offer maximum protection on all hydraulically actuated and other equipment utilizing low pressure circulating oil systems. Maintenance and production costs are reduced because Marvel Synclinal Filters BALANCED design offers greater ACTIVE filtering area with sufficient storage capacity for filtered out damaging particles, thus, longer periods of productive operation are attained at minimum "down time" due to maintenance and repairs.

PRODUCTION ENGINEERS and MAINTENANCE MEN whose job it is to keep production machinery operating at peak efficiency and who have recognized the superiority of Marvel Synclinal Filters in the filtration of hydraulic oils, fire resistant hydraulic fluids, coolants, lubricants, etc. are specifying Marvel Synclinal Filters on all new equipment and standardizing with Marvel Synclinal Filters on all machines within their plants.

Another outstanding reason for their preference is the simple construction of Marvel Synclinal Filters which allows them to be easily disassembled, thoroughly cleaned and reassembled on the spot, by any workman in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installations (as described in catalog). Choice of Monel mesh sizes range from coarse 30 to fine 200.

Catalogs containing complete data available on request

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer Immediate Delivery!

MARVEL ENGINEERING COMPANY

7227 N. Hamlin Ave., Chicago 45, Ill.
Phone: JUNIPER 8-6023

MY-4

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated —

- ☐ Catalog No. 107—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog No. 301—For WATER
- ☐ Catalog No. 200—For Fire-resistant hydraulic fluids.

Name .....
Title .....
Company .....
Address .....
City .....
State .....

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Landis Machine Co., Waynesboro, Pa., (Pipe).
Lewis Machine Co., 3441 E. 76th St., Cleveland 27, Ohio
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Machine Div., American Chain & Cable, Bridgeport, Conn.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Hamilton Div., The Lodge & Shipley Co., Hamilton 1, Ohio.
Wallace Tube Co., 1304-08 Diversey Pkwy., Chicago, Ill.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo.

CUTTING-OFF WHEELS, Abrasive

Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, Box 101, Toledo 10, Ohio.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2424 Douglas St., Rockford, Ill.
Michigan Drill Head Co., Detroit 34, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Shenango-Penn Mold Co., Dover, Ohio
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

CYLINDERS, Pneumatic

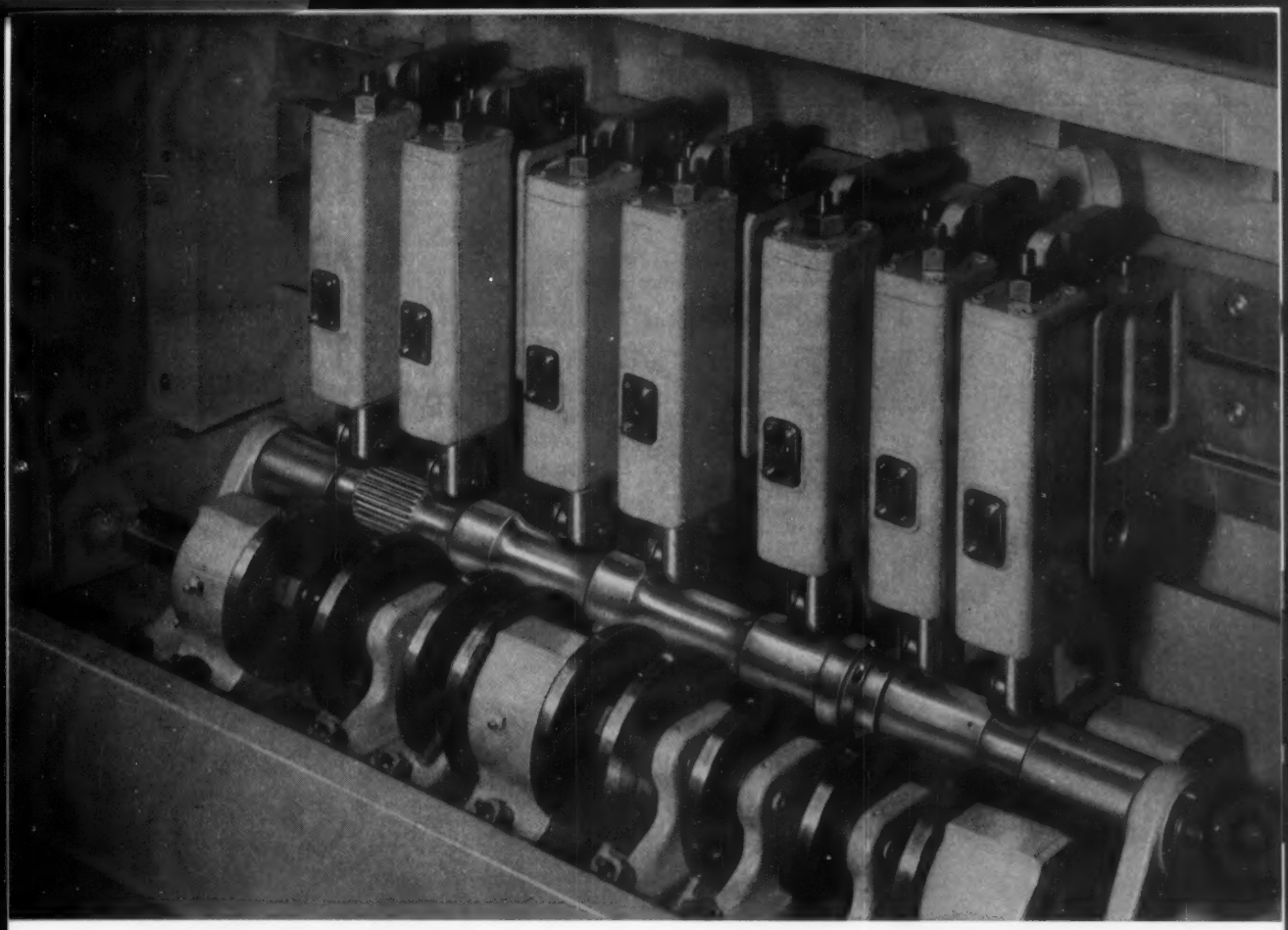
Shenango-Penn Mold Co., Dover, Ohio

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(*Continued on page* 318)

For more information fill in page number on Inquiry Card, on page 257



How to eliminate *your* shaft distortion problems

Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$″ to 4″ in diameter, 6″ to 40″ in length, with integral cams or shoulders up to 8″ diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.

The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

When steel is 3 times stronger than iron . . .

Has two and one-half times the rigidity . . .

Yet costs a third as much per pound . . .

WHY aren't more of your products designed for welded steel

Ask
THE LINCOLN ELECTRIC COMPANY
Cleveland 17, Ohio

Creating lower costs for industry . . . with welded steel

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Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Walker, O. S. Inc., Worcester, Mass.

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Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co. 14230 Birwood Ave., Detroit 4, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING
See Castings, Die

DIE-CASTING MACHINES
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

DIE CUSHIONS
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St. Chicago, Ill.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Kennamental Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.

DIEMAKERS' SUPPLIES
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mach. Co., Oakley, Cincinnati 9, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Pratt & Whitney Co. Inc., West Hartford, Conn.

DIE SETS, Standard
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 225 N. 18th St., Ampere, N. J.
Wales-Strippet Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

DIE STOCKS
See Stocks, Die

DIES, Lettering and Embossing
Acromark Co., 9-11 Morrell St., Elizabeth, N. J.

DIES, Sheet Metal, Etc.
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mach Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.

DIES, Threading
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.

DIES, Threading, Opening
Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DIES, Thread Rolling
Pratt & Whitney Co. Inc., West Hartford, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DISCS, Abrasives
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester, Mass.

(*Continued on page 322*)

Here's the NEW

SIMONDS

"Easy Access"

(100′ COIL)

METAL CUTTING BAND SAW PACKAGE

Makes it easy to remove or retract any length of blade . . . Saves your fingers . . . Protects the teeth . . . Holds 100 lineal feet.

There's no "fighting the box" or tearing your fingers with this new, easy dispensing Simonds Band Saw Package. Its special design makes it easy to pull out any desired length of blade *and retract any excess* without straining or nicking your fingers on the sharp points of the teeth.

Look for . . . ask for . . . this handy new 100′ coil package now!

Specify SIMONDS for all your Metal Band Saw needs . . .

- Standard Tooth (Regular or Wavy Set),
- Sabre Tooth (with a hook), Skip Tooth,
- Spring Temper, High Speed Steel

. . . for longest life and lowest cost on contour, cut-off or general purpose work.

FERROUS MATERIALS
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SIMONDS
Hard Edge METAL BAND SAW
SPEED (S.F.P.M.)
MAGNESIUM
NON-FERROUS MATERIALS
SIMONDS SAW AND STEEL CO.
100 Ft. SIMONDS HARD EDGE METAL BAND SAW Width ½ Teeth per in. 10 Set REG

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SAW AND STEEL CO.
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Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
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Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

For Fast Service from Complete Stocks

Call your SIMONDS Industrial Supply DISTRIBUTOR

For more information fill in page number on Inquiry Card, on page 257

This is why you

The One-Master Air Gage. Features that make it *the* Air Gage for your plant

1 **One master, only, required.**

2 **Constant, positive accuracy.** Its balanced air system is positively controlled — its accuracy built in. It can't drift.

3 **Dependable stability.** Unaffected by surges, or changes in air pressure.

4 **Linear, direct reading scale.** Not a "go" and "no go" gage. Its positively controlled accuracy permits a calibrated linear scale having graduations of ***known value.***

5 **Longer range per magnification** .003" and .0015", on 2,500 to 1 and 5,000 to 1 respectively, take care of 90% of gaging requirements and provide the following advantages:

Greater Plug clearance makes easier and faster application of gage heads to work. More foolproof . . . less wear.

Longer approach range. Operator sees how he's doing before workpiece dimension reaches the required size, eliminating scrap.

Longer gage head wear. Greater range and clearance enable gage heads to wear longer. Gage heads easily refinished.

Greater jet protection. Lower jets protected from damage.

6 **Fast, easy setting.** Positive setting in ten seconds. No fiddling around balancing air pressure.

7 **Easiest to install.** Connect directly to air supply. Filter already attached. Pressure regulator which assures ample protection is built in — only 40 lbs. pressure required.

8 **Less maintenance.** Gage system better protected, larger jets stay clean. Maintenance is negligible if gage is installed properly.

9 **Easily adaptable to special requirements** and combined with electrical and electronic units for *automatic gaging and machine control.*

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

need only ONE master!

This air gage system *is basically different from that of other air gages.* It employs a *balanced air system.* One side of this system — the measuring side — is *rigidly fixed.* There is no adjustment and measurements *cannot vary.* Hence, the gage *is linear* over its long range and *can be calibrated* and *set with a single master.* Because of this, the Dimensionair is an air gage of dependable stability. *It cannot drift . . . throughout its long range.* In these ways the Dimensionair is different from gages requiring two masters.

The balancing side of the system has a *single* zero adjustment. This enables you to set the Dimensionair positively and instantly to zero, *with a single master,* as you do a Dial Indicator, Micro-Electric Meter, Electronic Comparator or other precision measuring instrument. Excess bits of dirt, oil or water *do not* affect the Dimensionair any more than they do other air gages. *But,* some gages are too *insensitive* to show up such failure.

If you are familiar with ordinary air gages requiring two masters, you'll appreciate the advantages of using *one* master. You *save half the cost of masters* and you set the gage as easily and simply as you set your watch. Moreover, you will experience, for the first time, a confident feeling of *dependable, non-drifting,* precise measuring.

The Dimensionair's basic system enables it to be *combined directly* with electrical and electronic units as used with *Machine Control* and *Automatic Sorting* Gages. This makes unnecessary the accessory equipment required by other air gages and permits higher speeds, greater precision—with assured stability. It is much easier to set the gage to the spread between electrical contacts; e.g. the spread between the machine's fine feed and the finish feed. Adjusting to zero *does not* affect this spread setting.

Why not find out for yourself the importance of these facts? Ask to have a Dimensionair put in your plant so you can try it with your own personnel. *Compare it with any other air gage* you may already own or any you may wish to have brought in for comparison.

FEDERAL PRODUCTS CORPORATION

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Federal's solution to the cost of gaging:
Impartial Gage Selection
Engineering Follow-Through
Everything In Gages

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We'd like to test a Dimensionair in our plant.

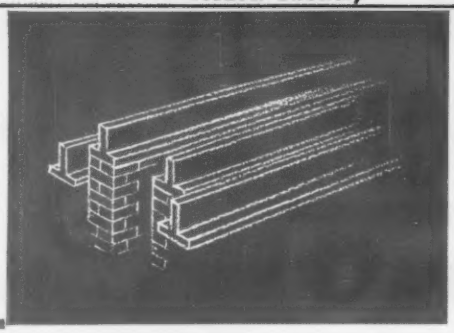
Company Name.....

Your Name.....

Title.....

Address.....

HOLCROFT and the WALKING BEAM FURNACE



Step up production of l-o-n-g parts

The walking beam furnace is an automatic, high production furnace usually used for treating bar stock, tubes, axles, and similarly shaped products.

Stock handling is ingenious. Two sets of rails—one stationary—run the length of the furnace. The moving set lifts the stock, travels forward, and then drops down below the level of the stationary rails. The rails return to their original position and repeat the action, walking the work through the furnace. An alternate arrangement includes two sets of moving rails. One pair lifts the stock as the second moves backward. The first comes down, deposits the work on the second, which moves forward conveying the work through the furnace cycle.

Yes, there's more to designing a heat treat furnace than a knowledge of metallurgy. Other factors—stock handling for one—must be considered, too. That's why it's a good bet to bank on Holcroft experience. It will pay off in the long run.

Write for your copy of Blazing the Heat Treat Trail.

HOLCROFT AND COMPANY

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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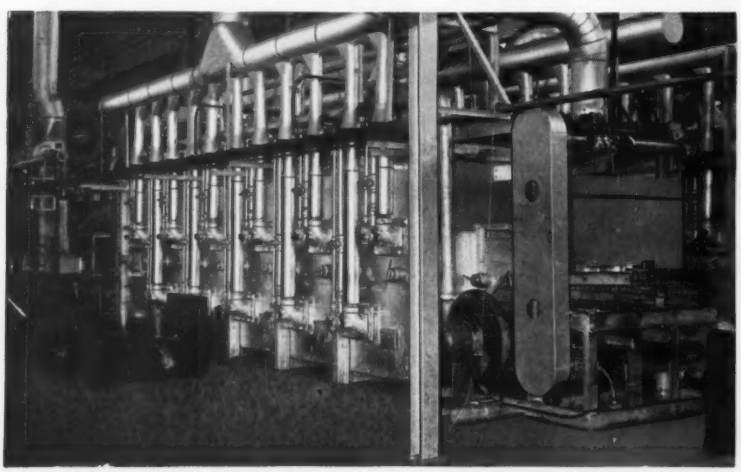
CANADA: Walker Metal Products, Ltd., Windsor, Ontario



Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Thor Power Tool Co., Aurora, Illinois
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS

Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment

DOLLIES

Mighty Mover Co., 1482 S. Milwaukee St., Denver 10, Colo.

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Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio
Metal Carbides Corp., Youngstown, Ohio.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, DRILL

Armstrong, Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

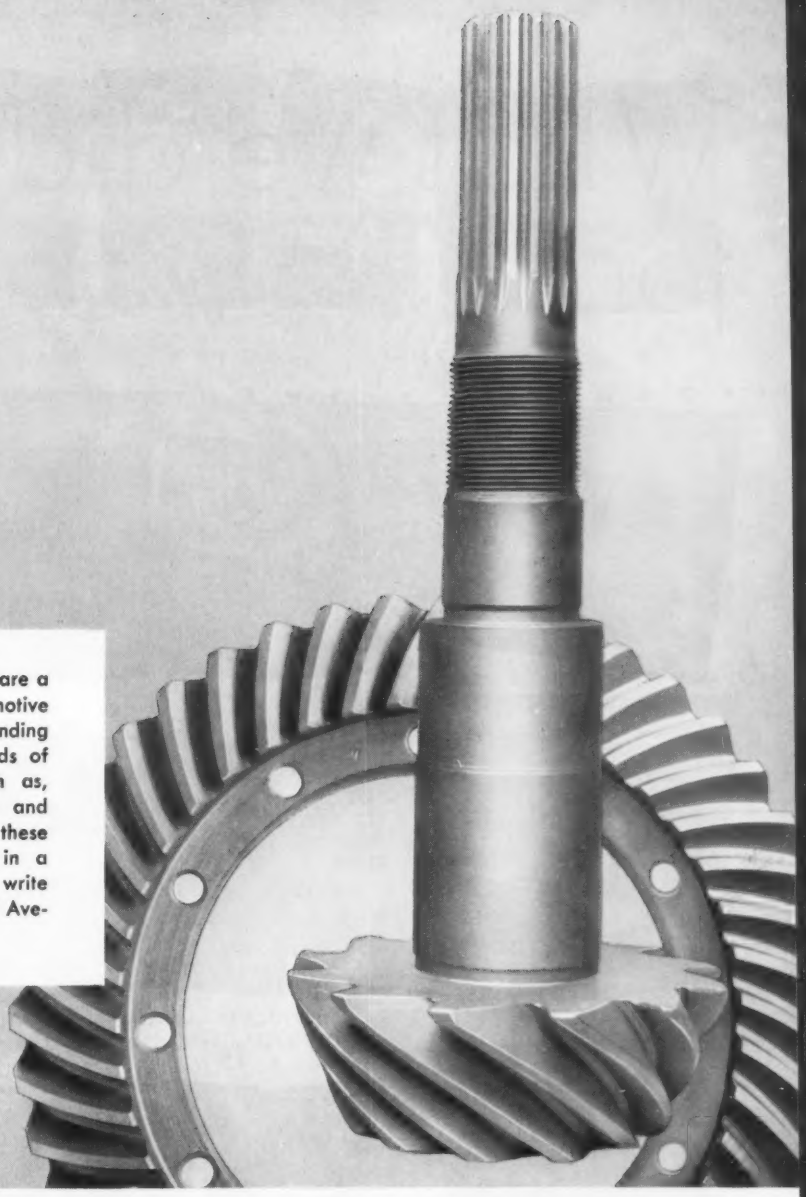
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., Broadway, Buffalo, N. Y.
Buhr Machine Tool Co., Ann Arbor, Michigan
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich
Govro-Nelson Co., 1933 Antoinette St., Detroit 8, Mich.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakewood Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill

(Continued on page 326)

"IT'S BETTER IF IT CONTAINS MOLY"



Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 13.

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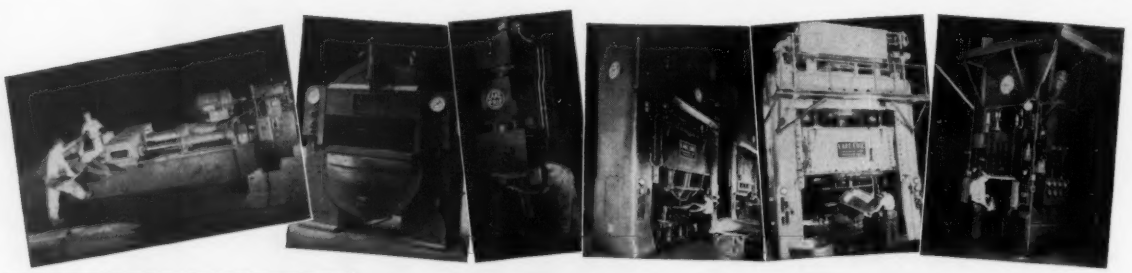
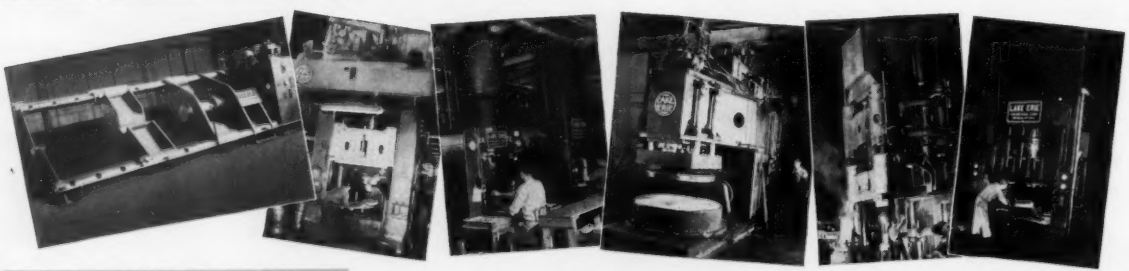
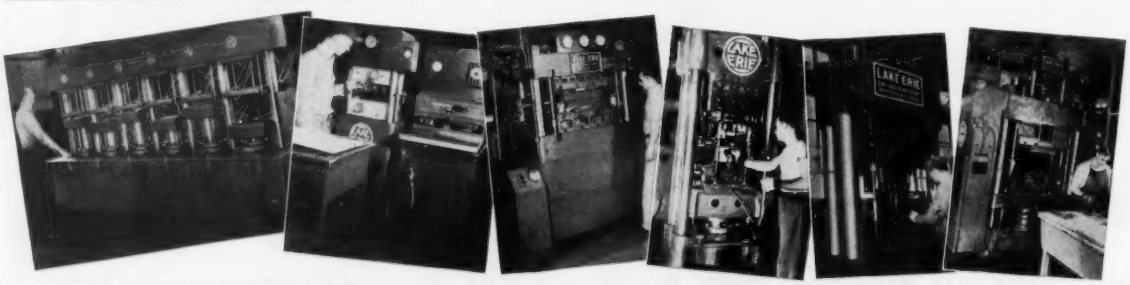


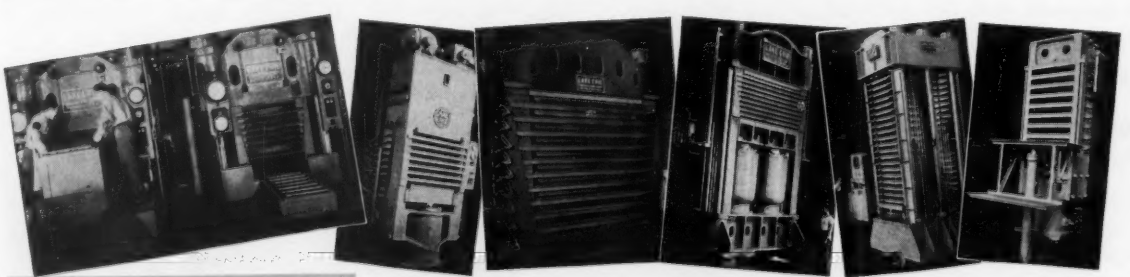
METAL WORKING — DRAWING • BENDING • FORCING



METAL WORKING — FORGING • HOBBING • FLANGING



PLASTIC MOLDING — COMPRESSION • TRANSFER • LABORATORY



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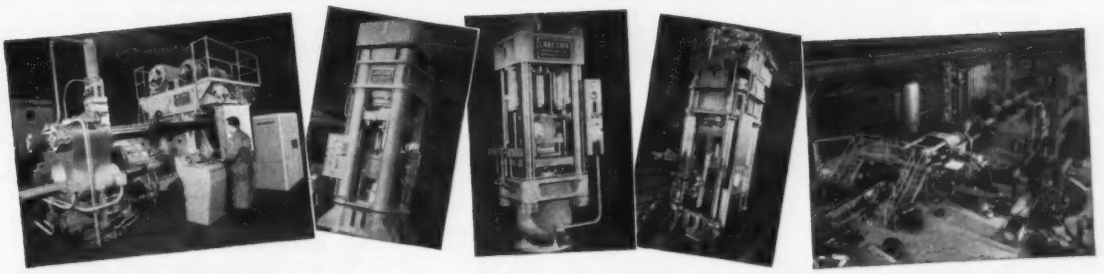

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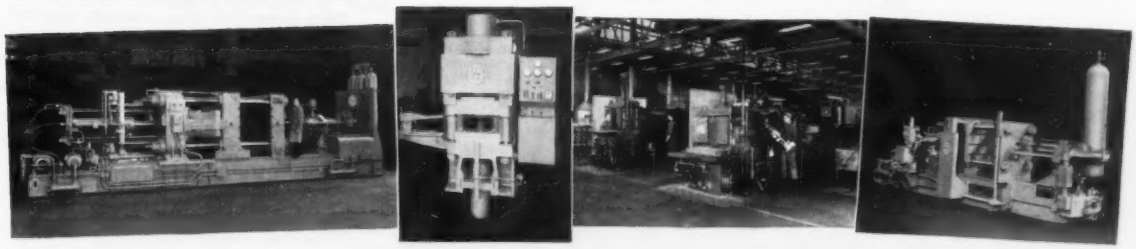

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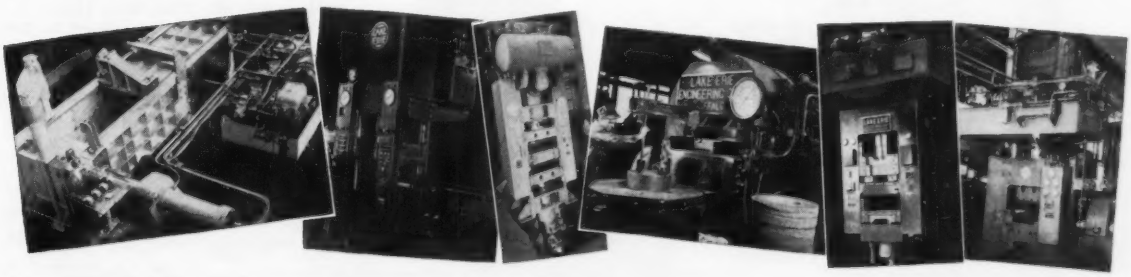

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Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
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Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
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(Continued on page 328)

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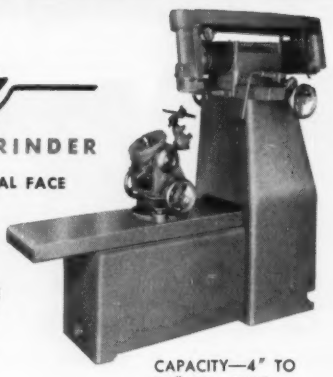

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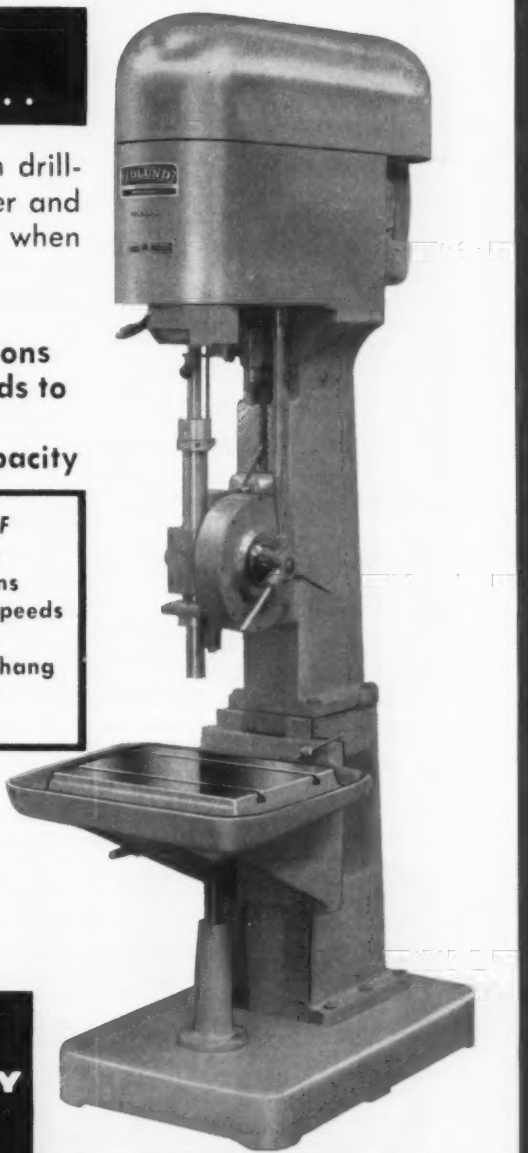

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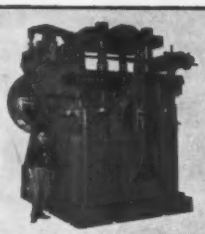

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DRILLING MACHINES, Rail

See Drilling Machines, Gang

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Hartford Special Mchry Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
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Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
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(*Continued on page* 330)

2 for 1 lathe

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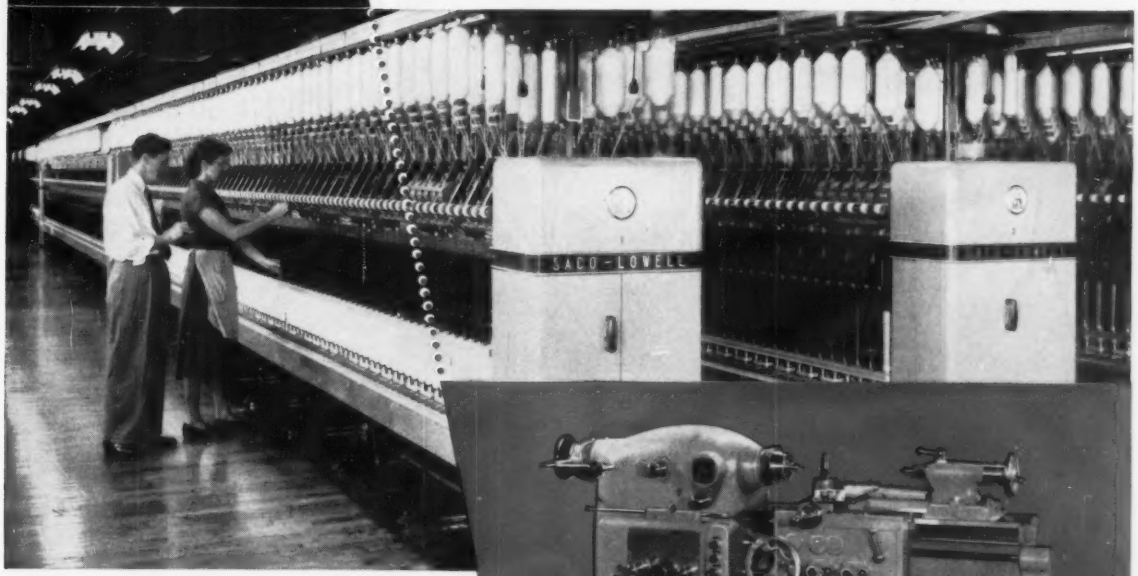

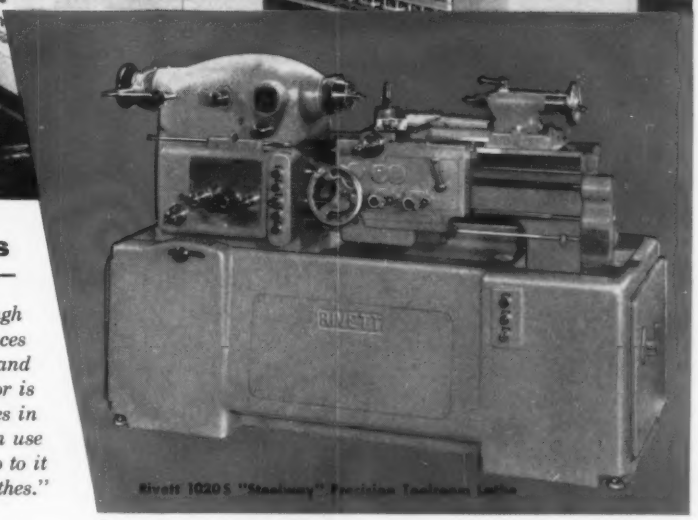

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Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL, Core
Ace Drill Corp., Adrian, Michigan.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Deep Hole
Ace Drill Corp., Adrian, Michigan.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Star Cutter Co., Farmington, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati Ohio.
Thor Power Tool Co., Aurora, Illinois

DRILLS, Portable Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York 9, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Illinois

DRILLS, Rachet
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Subland
Ace Drill Corp., Adrian, Michigan.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist
Ace Drill Corp., Adrian, Michigan.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
(*Continued on page* 332)

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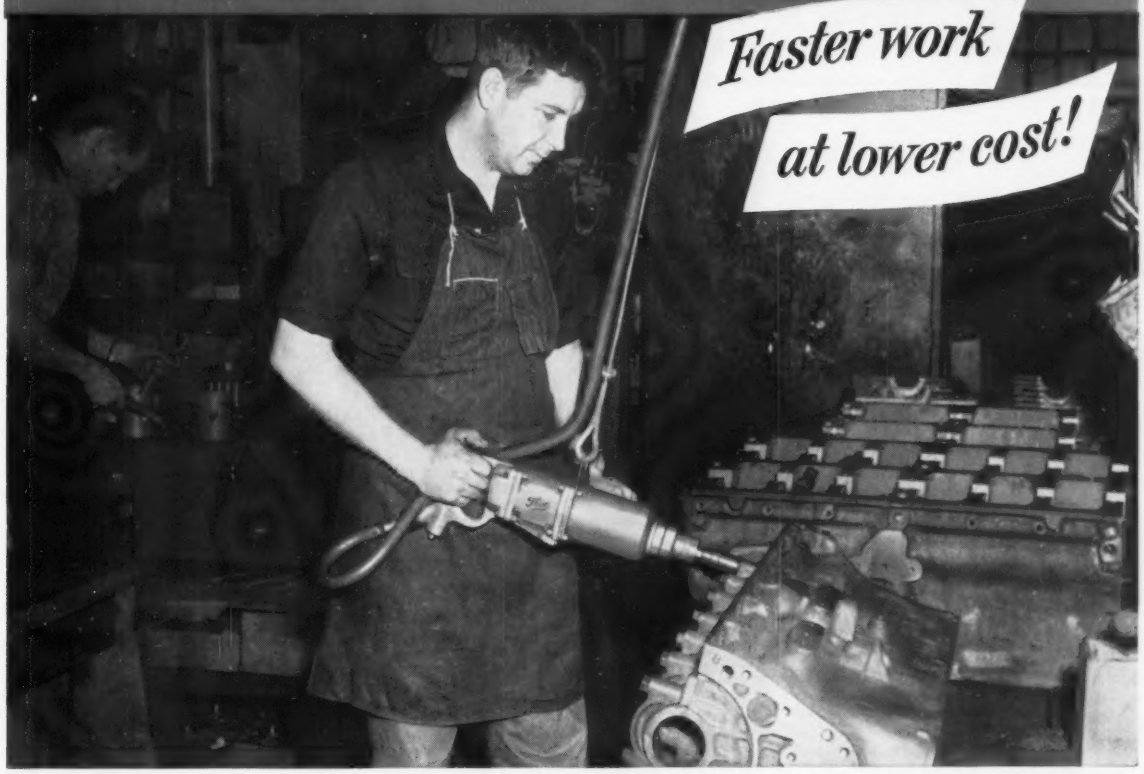

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THOR POWER TOOL COMPANY

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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Spiral Step Tool Co., Chicago 25, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire

Ace Drill Corp., Adrian, Michigan.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DUPLICATORS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney Co., Inc., West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Penna.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

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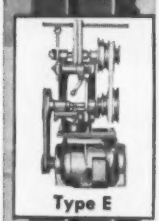
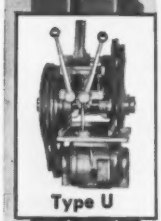
EM56B—with 4-speed Type E, Underneath Motor Drive in Cabinet base.



Type E



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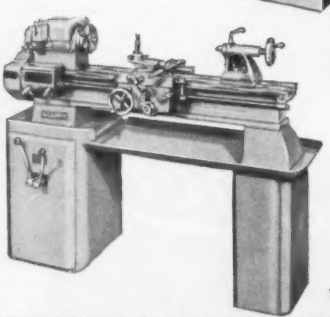

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EMERY WHEELS

See Grinding Wheels

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Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Screw

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Michigan Drill Head Co., Detroit 34, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic

Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications

American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Heller Tool Co., Newcomerstown, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Coolant and Oil

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engineering Corp., Meriden, Conn.
Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

(*Continued on page* 334)

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Lowe Bros. Co., Dayton, Ohio.

FLEXIBLE COUPLINGS
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FORGINGS, Machines (Upsetting)
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American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

FORGINGS, Drop
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset
Bethlehem Steel Co., Bethlehem, Pa.
Mueller Brass Co., Port Huron 35, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES
American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N.E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Gerrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

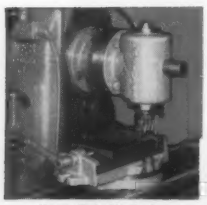
FURNACES, Heat-Treating
Ajax Electric Company, Philadelphia, Pa.
General Electric Co., Schenectady 5, N. Y.

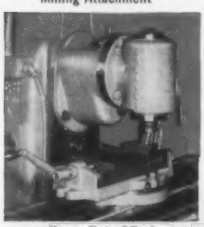
FURNITURE, Shop
Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scherr, George, Co., Inc. 200 Lafayette St., New York 12, N. Y.

GAGES, Air
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

(*Continued on page 336*)


Heavy Duty Vertical Milling Attachment


Heavy Duty Offset Vertical Milling Attachment

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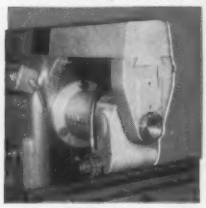
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Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.

GAGES, Depth

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
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Federal Products Corp., P.O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Elgin National Watch Co., Aurora, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Winter Bros. Co., Rochester, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield St., Dayton 17, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Thread

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Size Control Co., 2500 W. Washington Blvd., Chicago 12, Ill.
Winter Bros. Co., Rochester, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

(*Continued on page* 338)

FOUND WHERE FINE BUSINESS MACHINES ARE "BORN"

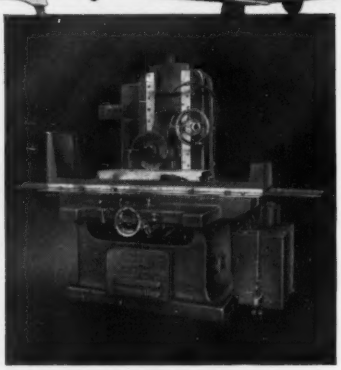
GRAND RAPIDS GRINDERS

INTERNATIONAL BUSINESS MACHINES

Producing an intricate business machine requires exceptional toolroom precision. That's why these manufacturers use Grand Rapids Grinders . . . engineered to achieve extraordinary grinding precision at cost-cutting speed.

Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!

Whether you make business machines or bulldozers, you can count on Grand Rapids Grinders for maximum toolroom precision.



GALLMEYER & LIVINGSTON

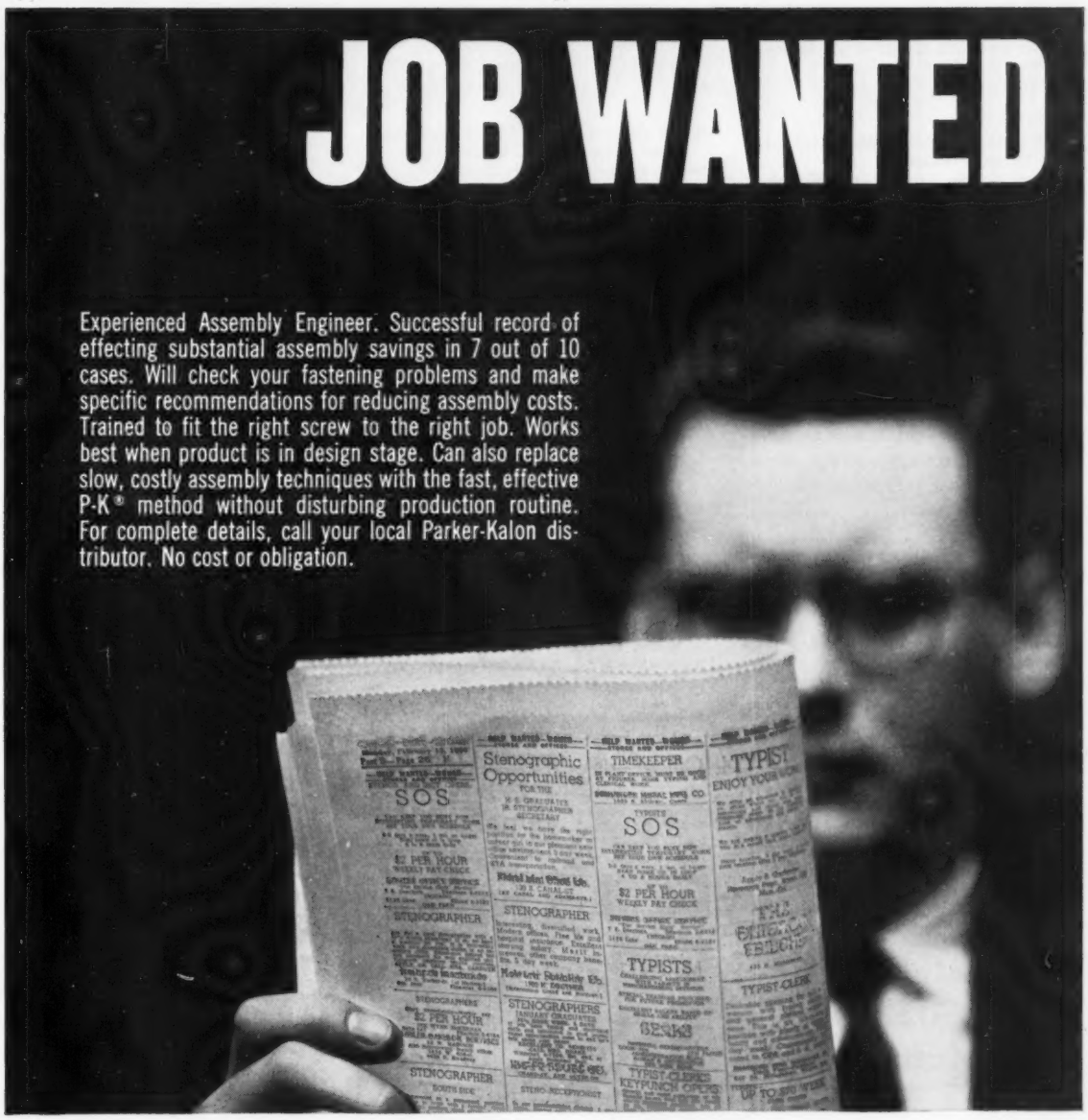
GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speed 1925 and 2500 rpm.

A note on your letterhead will bring complete details.

GALLMEYER & LIVINGSTON COMPANY
305 Straight Ave., S.W., Grand Rapids, Michigan

JOB WANTED

Experienced Assembly Engineer. Successful record of effecting substantial assembly savings in 7 out of 10 cases. Will check your fastening problems and make specific recommendations for reducing assembly costs. Trained to fit the right screw to the right job. Works best when product is in design stage. Can also replace slow, costly assembly techniques with the fast, effective P-K® method without disturbing production routine. For complete details, call your local Parker-Kalon distributor. No cost or obligation.



this specialist wants to work for you!

Call in a P-K Assembly Engineer and find out how you can profit through reduced assembly costs the P-K way. Take advantage of this unique Parker-Kalon service—another of the many reasons why users say—"if it's P-K . . . it's O. K."

PARKER-KALON DIVISION, GENERAL AMERICAN TRANSPORTATION CORPORATION—CLIFTON, NEW JERSEY

PARKER-KALON® *fasteners*

Sold Everywhere Through Leading Industrial Distributors. Warehouse in Chicago, Illinois

For more information fill in page number on Inquiry Card, on page 257

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Bilgram Gear & Mch Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield Vt. (Straight and Hourglass Types).
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd. Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

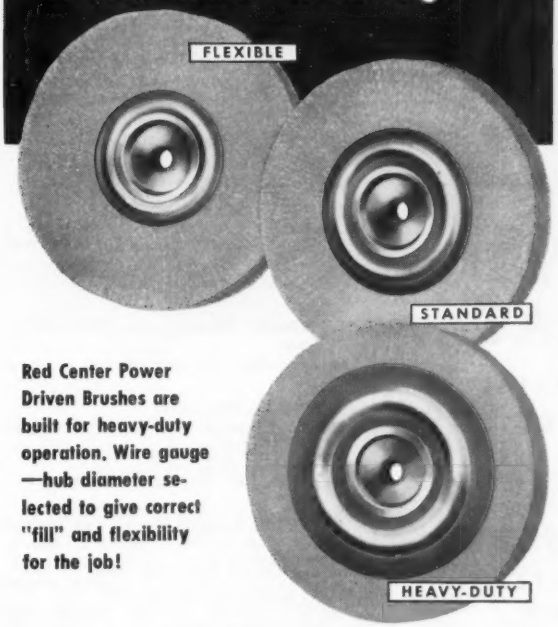
GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Bausch Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Wks, 1309 So. Cicero Ave., Chicago 50, Ill.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

(*Continued on page* 340)

The Heart of a good Coolant System
Ruthman GUSHER Coolant Pump
This 16" Model 280 Springfield Lathe is equipped with a Ruthman "Gusher" Coolant Pump. Photo courtesy Springfield Machine Tool Co.
Yes, a "Gusher" Coolant Pump is truly the heart of a *really good* Coolant System.
A "Gusher" gives you split-second coolant flow without priming. Its simple design eliminates the need for packing, foot or relief valves and it requires less power when throttled. The dynamic balancing of the entire rotating assembly minimizes vibration. The rugged construction with over-sized pre-lubricated ball-bearings reduces attention to a minimum. The result is a *better*, more dependable performance for all "Gusher" Coolant Pumps.
MODEL UL 7120
THE RUTHMAN MACHINERY CO.
1807 Reading Rd.
Cincinnati, Ohio

New Pittsburgh Red Center construction assures faster, better, easier brushing!



Red Center Power Driven Brushes are built for heavy-duty operation. Wire gauge —hub diameter selected to give correct "fill" and flexibility for the job!

Here's how Red Center Brushes work

Even distribution of wire is made around the hub. Naturally the hub size determines amount of wire used. The larger the diameter the more wire used and more rigidity obtained. Three diameter sizes: Flexible (Long Trim), Standard (Medium Trim), Heavy-Duty (Short Trim), all built with gauge wire you specify.

What does Red Center mean to you

Pittsburgh Red Center means precision brushing made by uniform "fill" of a specific gauge, quality wire—mounted in a specially designed hub to give exact brushing surface and strength required. With all these features you're assured of longer brush life, faster cutting, finer finishing.

GET THE FACTS: for information regarding your specific brushing problems, write: PITTSBURGH PLATE GLASS CO., *Brush Div.*, Dept. W-4, 3221 Frederick Ave., Baltimore 29, Maryland.

PITTSBURGH *Power Driven* **BRUSHES**

BRUSHES • PAINTS • GLASS • CHEMICALS • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

For more information fill in page number on Inquiry Card, on page 257

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
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Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
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New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

GEARS, Rawhide and Non-Metallic

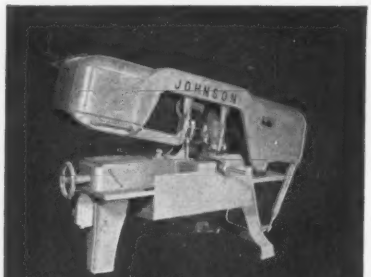
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

GEARS, Stamped

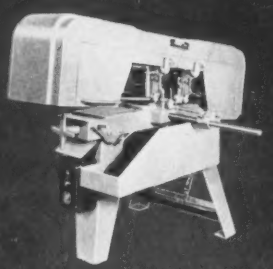
Winzeler Mfg. & Tool Co., 1712 W. Arcade Pl., Chicago 12, Ill.

GENERATORS, Electric

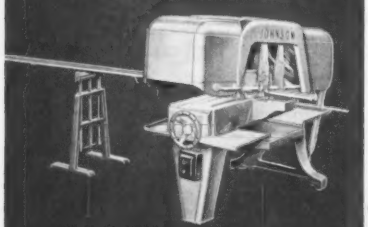
General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.



Model J (Heavy-Duty) Wet or Dry models. Easily handles 10" rounds, 18" flats.



Model B (Wet or Dry) For precise cut-off of 5" rounds, 10" flats.



Adjustable Stock Stand, provides rigid work support to speed production. Adjusts safely under heavy load.

TRIPLE THREAT...

TO HIGH METAL CUTTING COSTS

Johnson

METAL CUTTING BAND SAWS

FAST • TOUGH • ACCURATE

If you've got a tough cutting problem in your plant, a Johnson Saw is your best bet to solve it. Controls are centralized, easy to reach. Set up is simple. Operation is automatic, and speed control variable. See for yourself how a Johnson Saw will save time . . . labor . . . and dollars in your own plant.

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Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches., Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Madison-Kipp Corp., Madison, Wis.
Thor Power Tool Co., Aurora, Illinois

GRINDERS, Portable Electric and Toolpost

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thor Power Tool Co., Aurora, Illinois

GRINDING FIXTURES

Geometric Tool Co., (Die Chaser), Westville Station, New Haven 15, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio
U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach

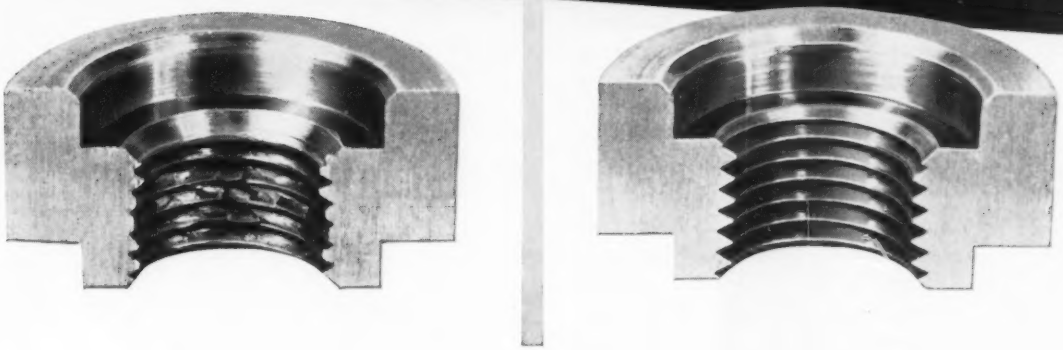
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

(*Continued on page* 344)

Why BALANCED CHEMICAL ACTIVITY in a cutting oil?



Left. Cupro-nickel bushing, cut in half to show internal threads, produced with a competitive straight oil.

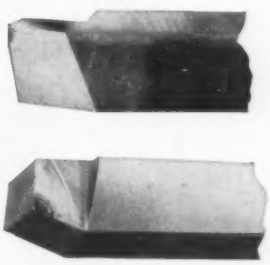
Right. Same type cupro-nickel bushing produced with Stuart's Thredkut X-18—providing controlled chemical activity.

The touch of a cutting oil with *balanced* chemical activity is easily recognized. It's the exceptionally smooth, satiny finish on part after part, even from soft, tough, stringy material . . . and increased tool life.

Stuart's Balanced Cutting Oils have controlled active sulphur and chlorine held in true chemical combination. Each oil is balanced to meet a specific range of job requirements from tapping, threading, gear shaping and gear hobbing to general purpose automatic screw machine work. Stuart oils with high sulphur activity are processed for the more difficult machining of soft, tough, stringy materials such as low carbon and stainless steels, monel metal and jet engine alloys. Oils with lower sulphur activity are designed for high speed machining of free-cutting materials such as B1112, B1113, leaded screw stocks, brass and aluminum alloys.

The "active" sulphur content of Stuart's Balanced Cutting Oils, as opposed to "lazy" sulphur, provides the anti-weld qualities that are so necessary to obtain smooth finishes. The active chlorine and fatty oil content provides the improved lubricity and temperature control to assure the best possible results in production.

Have "the Man in the Barrel", your Stuart Representative, assist you in selecting the right cutting oil for your job. Write for Stuart's Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder, too. It's a quick guide to starting recommendations on any job.



Top: Abnormal front clearance wear of cutting tool caused by excessive sulphur activity of cutting fluid.

Bottom: Cratering of cutting tool caused by insufficient sulphur activity.

D. A. STUART OIL CO., LTD., 2739 S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

Time Tested Cutting Fluids and Lubricants

how to spin a good yarn

The happy ending comes quickly when Avey machines are in the story, as the makers of this textile spindle base discovered. Savings in production time, direct labor, and plant space will probably return their equipment investment in a single, solitary year.

What makes Avey machines such high-yield investments? For one thing, they're generally simple assemblies of basic components on which the engineering has largely been paid for. Costs are lower; the price becomes more favorable; the savings per part, or per hour, pay off the investment sooner.

For another: we take our own medicine. You'll find most of the machines in our shop young, and shiny, and productive.

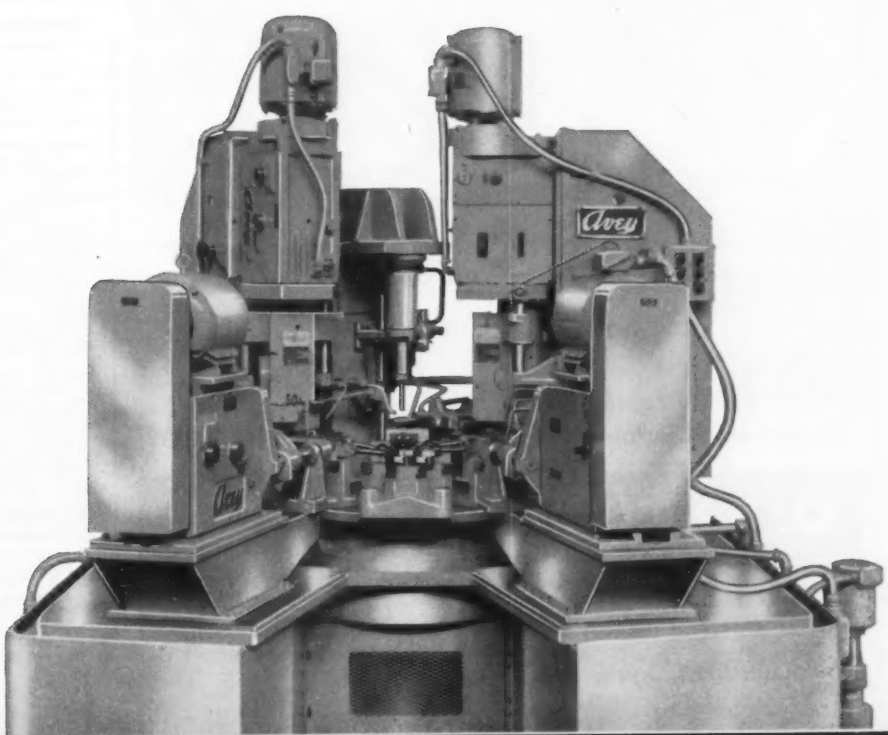
▸ **production data:** This 6-station Avey indexing machine performed drilling, tapping, milling, and broaching operations. Fixtures arranged to handle two different parts. Milling and broaching done in one pass, with cycle time of 8 seconds. Rate: 380 parts/hr. at 100% efficiency.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

with a happy ending

Avey



GRINDING MACHINES, Carbide Tool

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Van Norman Co., Springfield, Mass.

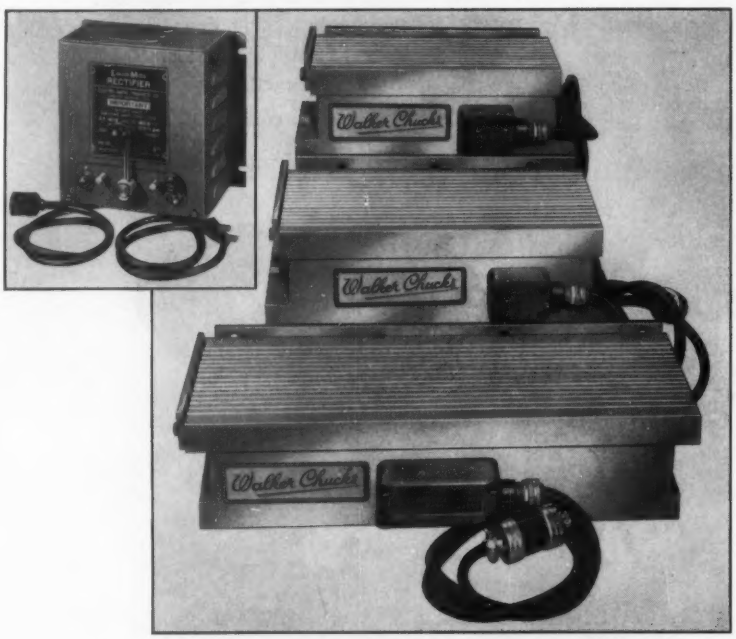
GRINDING MACHINES, Chucking

Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

Walker Chucks
You May As Well Have the Best



Walker Longitudinal Bar Pole Chucks . . . three popular sizes . . . low wattage, low price, maximum holding.

5" x 10"	$ 78.00
6" x 12"	$110.00
6" x 18"	$185.00

KD Rectifier with built-in switch to operate from any AC line $43.00

O. S. WALKER CO. Inc.
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Original Designers and Builders of Magnetic Chucks

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Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Frauenthal Div., Kaydon Eng. Corp., Muskegon, Mich.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Drill

American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
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Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

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See Flexible Shaft Equipment

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.

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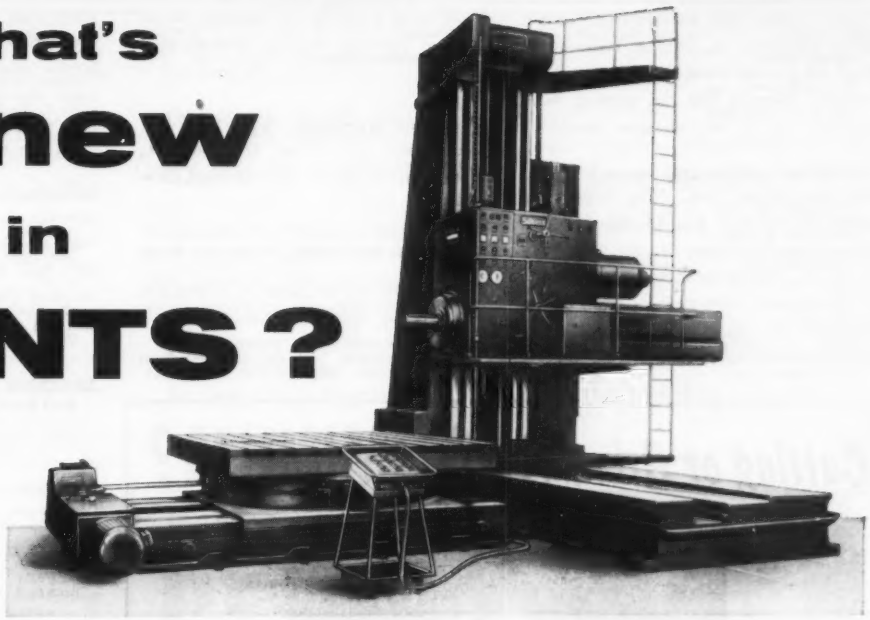
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

(Continued on page 346)

what's new in GIANTS?



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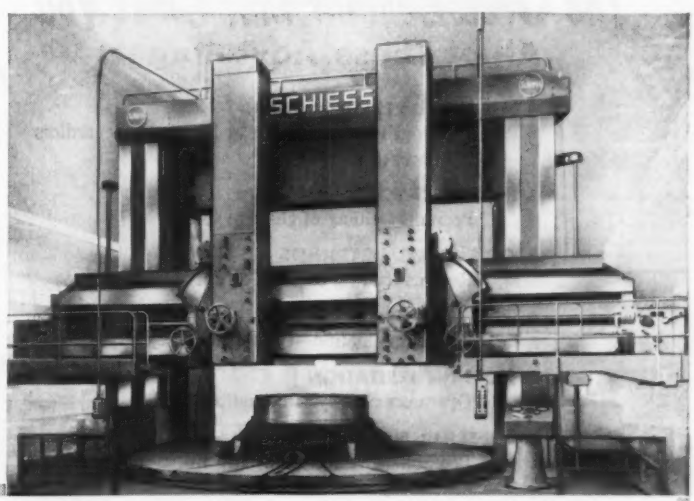

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Sole Distributor
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South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.

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Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frauenthal Div., Kaydon Eng. Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2448-90 River Rd., Cincinnati, Ohio.

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Pratt & Whitney Co. Inc., West Hartford, Conn.

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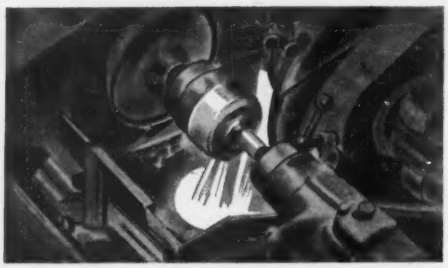

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Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

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Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

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Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

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Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
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Norton Co., 1 New Bond St., Worcester 6, Mass.

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Van Norman Co., Springfield, Mass.

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Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Eng. Corp., Muskegon, Mich.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.

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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

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Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

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Landis Tool Co., Waynesboro, Pa.
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Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co. 254 N. Laurel Ave., Des Plaines, Ill.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
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Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
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Ingersoll-Rand Co., Phillipsburg, N. J.

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Standard Pressed Steel Co., Jenkintown, Pa.

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(*Continued on page 348*)

5408

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Hydraulic Press Mfg. Co., Mount Gilead, Ohio
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Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
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5419

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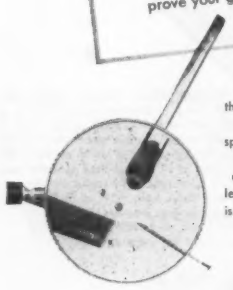

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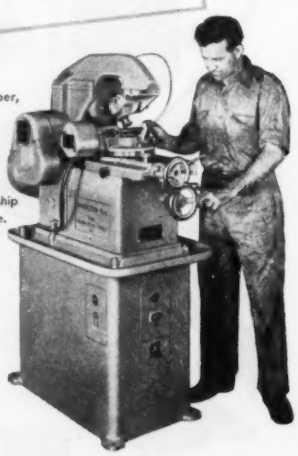

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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
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Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 Unviersity Ave., Rochester, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

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Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

LATHES, Axle

Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.

LATHES, Boring

Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio

(*Continued on page 350*)

5346

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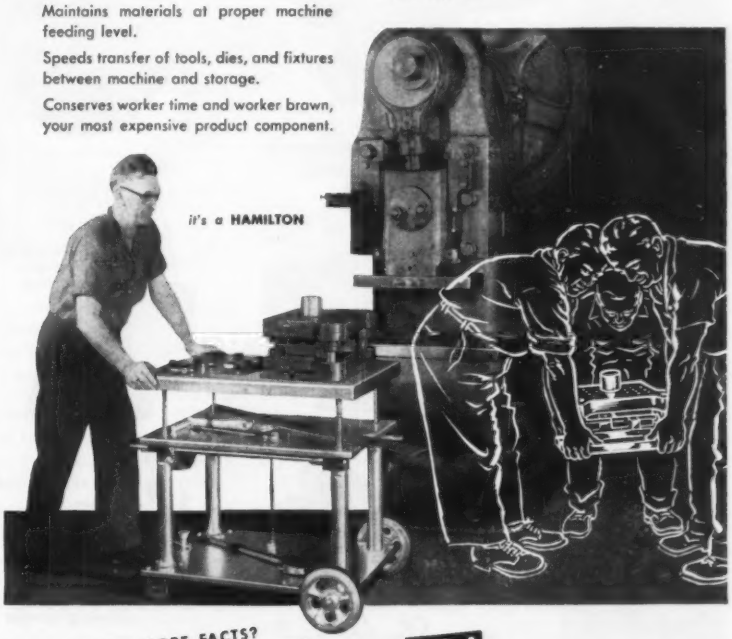

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Baldwin, Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
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Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
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Pratt & Whitney Co. Inc., West Hartford, Conn.
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Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

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(Continued on page 352)

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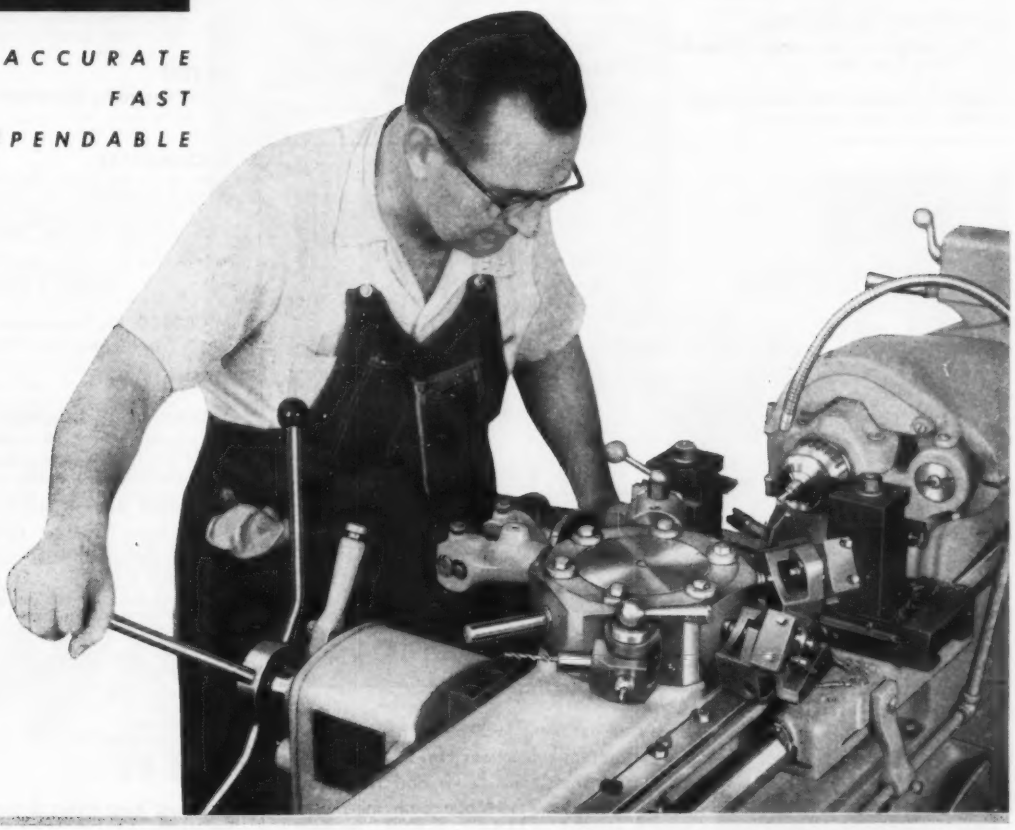

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The production of small parts requiring both exacting tolerances and high output calls for this new turret lathe. In it has been combined machining speed, handling ease, accuracy and rigidity for utmost efficiency on every job.

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SPECIFICATIONS: Swing 13⅛" • Collet capacity 1" • Spindle bore 1⅜" • Turret ram effective feed 6½" • Turning feeds 48 • Facing feeds 48 • Threading feeds 48 • Turret feeds 144 • Spindle speeds 12 • **Prices start at $2,344.**

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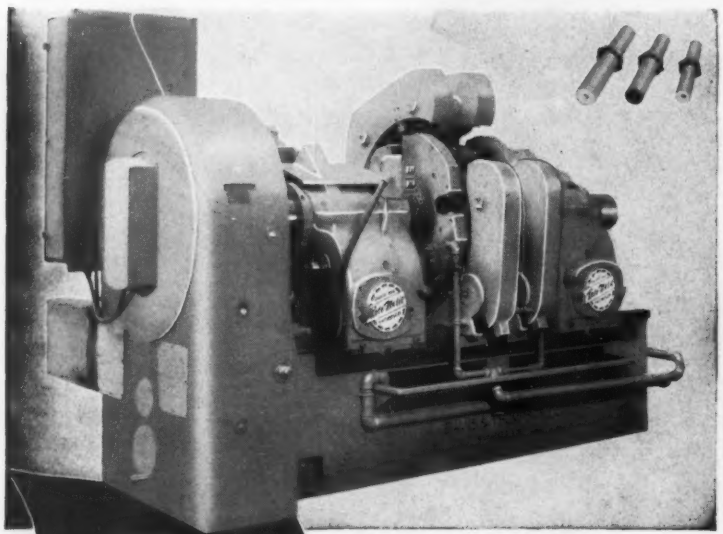

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Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

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Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney Co. Inc., West Hartford, Conn.
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Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., Milwaukee, Wis.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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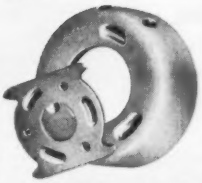
Atlas Press Co., Kalamazoo, Mich.
Hardinge Bros., Inc., (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.

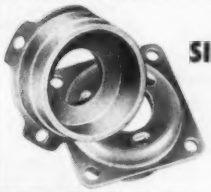
(*Continued on page* 354)

CARBURIZING

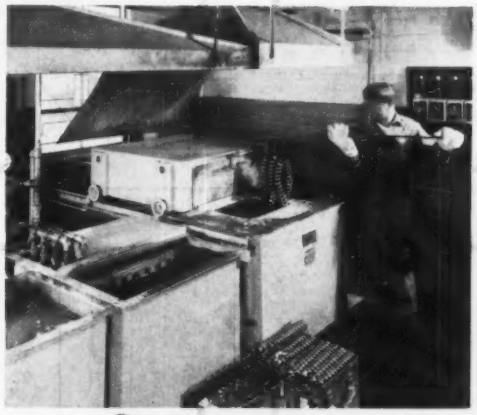


1 This is the operation for which the Leland salt bath was originally purchased. Work is heated at 1650° for 30 minutes, oil quenched and washed. A consistent, scale-free 0.005" case with surface hardness of R_{15N} 75/80 is obtained.

SIMULTANEOUS BRAZING AND CARBURIZING

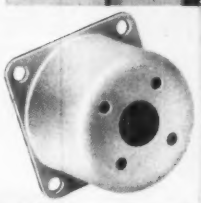


2 Simultaneous brass brazing and carburizing cut cost from $79 to $13.11 per 1,000 parts, eliminated 3 handling operations, saved time. Average strength of brazed joints is 40,000 PSI. Case depth is 0.005"—0.007" with R_{15N} 80/85 surface hardness.



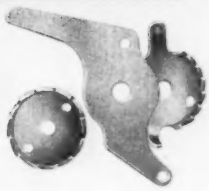
BRAZING

3 Ajax Salt Bath brass brazing of this assembly reduced costs from $14.20 to $9.10 per thousand—without considering the reduction in rejects from 25% to less than 1% and elimination of 3 additional treatments previously needed with copper brazing.



HARDENING

4 SAE-1050 and 1065 cold rolled parts are hardened in the same Ajax bath used for the 3 other operations. Hardened parts will bend 45° before fracturing. The "pick-up" of a superficially carburized case is not objectionable.



4 Cost-Cutting Operations with One AJAX Salt Bath

. . . that saved $37,000 the first 8 months!

Write for **details outlining the G. H. Leland Inc., multi-use operation of its Ajax salt bath.**

Let Ajax engineers demonstrate similar heat treating savings. You get actual proof on your own work samples in the Ajax Metallurgical Service Laboratories. No cost or obligation.

During its first 8 months on the job, this Ajax Electric Salt Bath Furnace saved $37,000 in the plant of G. H. Leland, Inc., Dayton, Ohio. This saving was figured after deducting *all* operating costs and 20% annual equipment depreciation!

Or, to put it another way, the amazing versatility of the Ajax furnace installation *enabled it to pay for itself in just a few months of use!*

Not only does the Salt Bath handle all four heat treating operations described and illustrated above . . . but the Leland model shop uses it for odd jobs as well.

Work is scale free. Distortion is no longer a problem . . . and the firm's entire parts processing has been effectively streamlined.

AJAX HULTGREN

AJAX ELECTRIC COMPANY
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Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Ingersoll Milling Mch Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., Milwaukee, Wis.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Snyder Tool & Engrg. Co., 3400 E Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Sunstrand Mch.. Tool Co., 2531 11th St., Rockford, Ill.

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Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co. 2442 Douglas St., Rockford, Ill.
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American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
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Frew Machine Co., 121 East Luray St., Philadelphia 29, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney Co., Inc., West Hartford, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

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Van Norman Co., 3640 Main St., Springfield 7, Mass.

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Bridgeport Machine, Inc., Linley Ave., Bridgeport, Conn.

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American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
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Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
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(*Continued on page* 356)

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Easily — and safely!

LAN-O-KLEEN helps to protect the skin as it cleans. WEST — *in pioneering the development of "double action" industrial cleaners* — was the first to impregnate *beneficial amounts* of free lanolin into a corn meal type hand cleaner.

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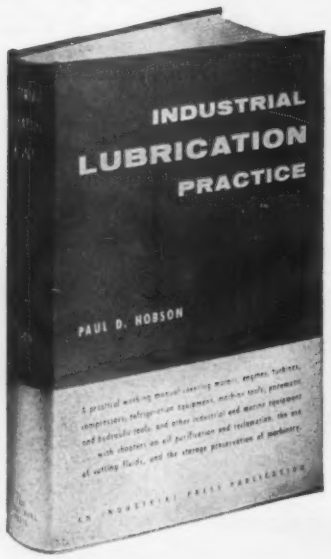

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(Continued on page 358)

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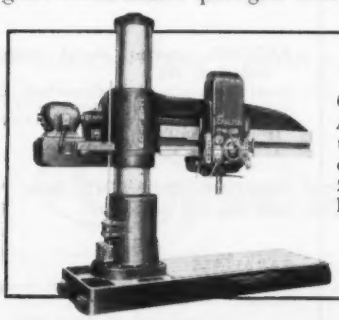

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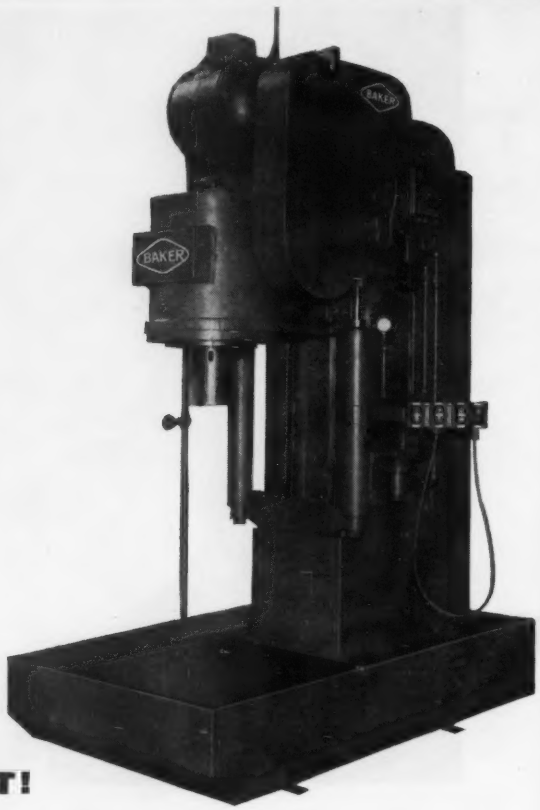

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(*Continuel on page* 360)

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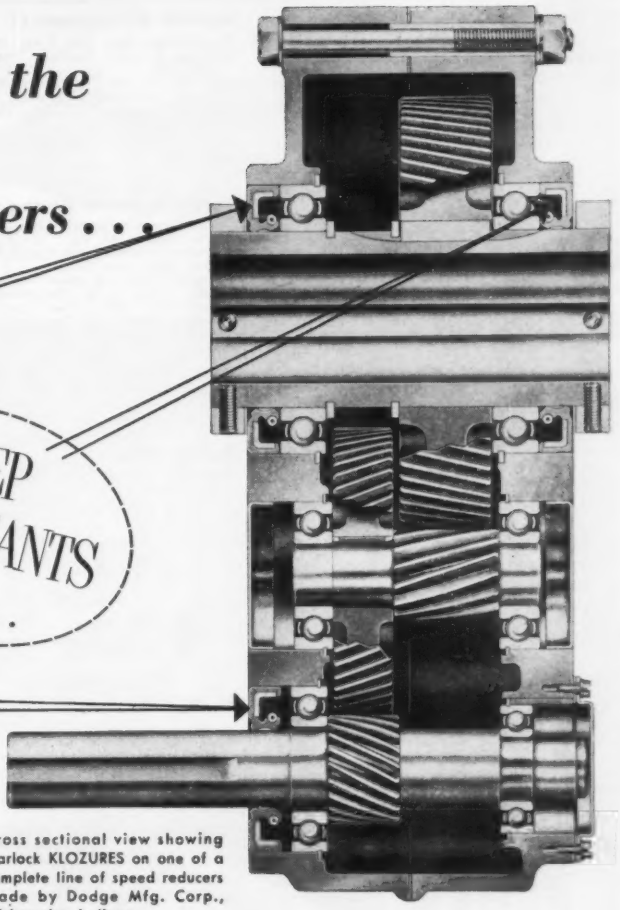

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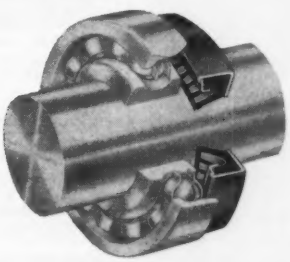

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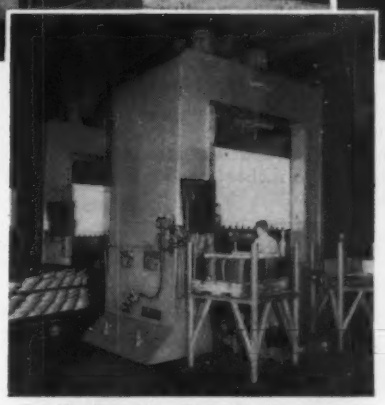

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Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Johnson Machine & Press Corp., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Philips & Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PROFILING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Gray-Mills Co., 1948-52 Ridge Ave., Evanston, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

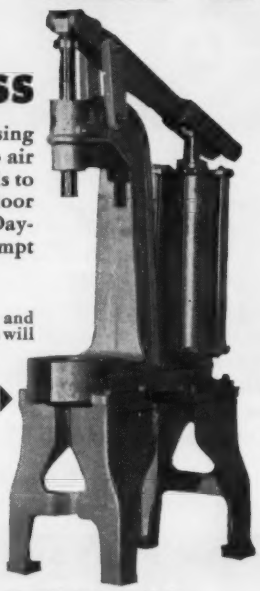
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.

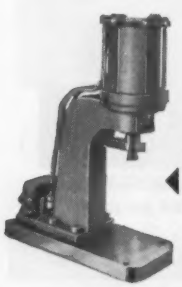
(*Continued on page* 366)

SAVE!

WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.





WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $519.

1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $232.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 509 S. WOLF ROAD, DES PLAINES, ILLINOIS

Bearings of the Future for Machines of Today

Rollway Maximum Bearings are used in the McDonnell Voodoo Jet

Gunned by higher speeds and higher temperatures, the performance demand for anti-friction bearings rises sharply every year. Here at Rollway, we strive always to keep abreast of the trend, and even to anticipate it. In precision, dimensional stability and simplicity, Rollway Maximum Bearings offer performance based on advanced thinking to original equipment and replacement buyers of today.

Start now, up-grade both your production machinery and your products with Rollway *bearings of the future.* Rollway Bearing Company, Inc., Syracuse 4, N. Y. Manufacturers of a complete line of radial and thrust cylindrical roller bearings.

ROLLWAY®
Maximum
ROLLER BEARINGS

ENGINEERING OFFICES: SYRACUSE • BOSTON • CHICAGO • DETROIT • TORONTO • PITTSBURGH • CLEVELAND • MILWAUKEE • SEATTLE • HOUSTON • PHILADELPHIA • LOS ANGELES • SAN FRANCISCO

the finest high production lathes

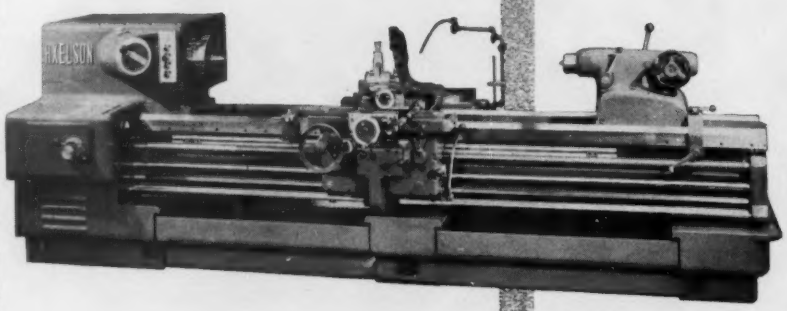
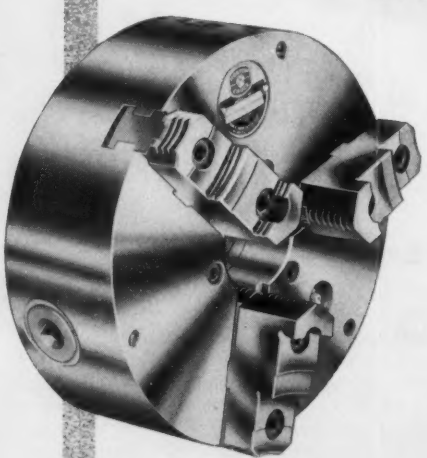


Photo courtesy
Axelson
Manufacturing Co.

Axelson's new 25/16 heavy-duty engine lathe is designed to increase production, reduce turning time and simplify operator control. It features 40 h.p. over 32 spindle speeds, a single lever hydraulic speed selector; 66 feed combinations, exclusive 5-position diameter cross-feed disconnect stop and 7-position longitudinal power-feed disconnect stop. For more information, write Axelson Manufacturing Co., 6160 South Boyle Ave., Los Angeles 58, California.

deserve the finest high production chucks

This is Horton's standard 3-Jaw Scroll Universal Chuck which has contributed to Horton's reputation for chuck leadership for over 100 years. Its precision and lasting accuracy make it a must in any production picture. For the complete story on the complete line of Horton Chucks, see the Horton people in your area now.



HORTON
Since 1851
CHUCK

WINDSOR LOCKS, CONN.

AXELSON production and maintenance news

AXELSON MANUFACTURING COMPANY / DIVISION OF U. S. INDUSTRIES, INC. / 6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA

New 32" heavy-duty lathe has 75-hp headstock... handles peak loads to 100 hp.

Axelson's new 32" heavy-duty lathe is a rugged tool that can be used with equal effectiveness on rough or precision cuts. It has 24 spindle speeds in true geometric progression from 6 to 750 r.p.m.

The main bed casting is designed for maximum stability and for resistance to the twisting forces of heavy-duty turning. The carriage bed ways are hardened and ground alloy steel.

Two levers control the selection of feed changes on the new Axelson totally enclosed gear box. There are 81 feeds, ranging from .005" to .351" per revolution of the spindle; 45 threads may be cut, ranging from 1 to 30 threads per inch. This range of feeds and leads is sufficient for the large majority of all machining operations.

The extra-heavy, box-type apron is completely enclosed, which permits all shafts and gears to run in a continuous oil bath. All carriage controls are located on the apron convenient to the operator. Clutch levers operate cross and longitudinal feed controls.

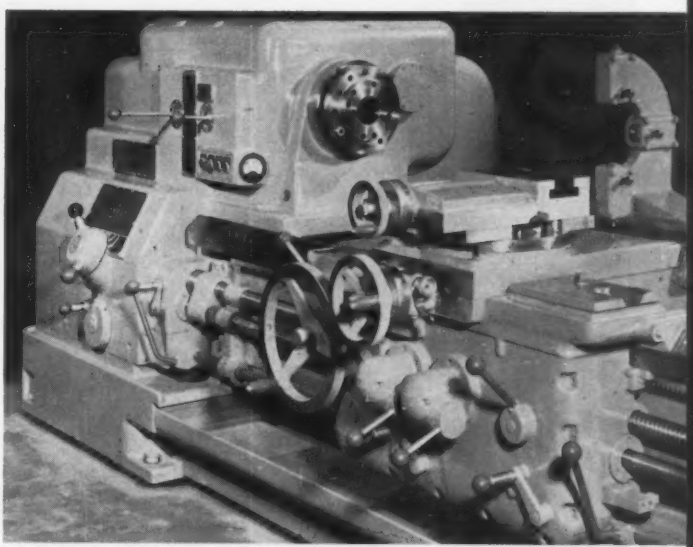
The tailstock is a rugged one-piece casting. The two-speed feature provides rapid movement of the tailstock center up to the work piece, and slow powerful movement of the spindle for feeding drills, reamers, or other tools held in center. The tailstock can be easily moved manually in either direction by a hand crank at the front of the machine.

A micrometer cross-feed positive stop, which permits the operator to set the cross-slide travel to stop at a predetermined point, is positive, will not slip, and will permit accurate dimensions to be duplicated repeatedly.

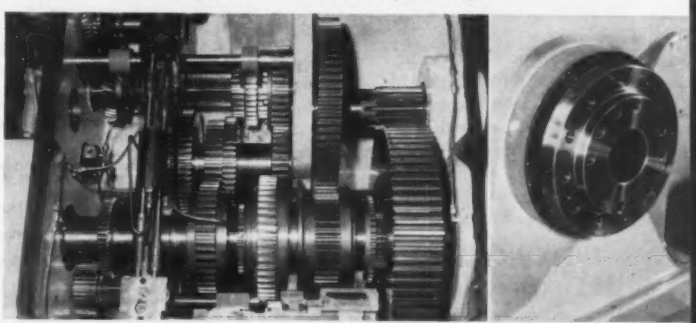
Standard equipment is the power rapid traverse for quickly moving the carriage in either direction. This feature saves valuable production time and reduces operator fatigue to a minimum. A lever mounted at the left-hand side of the carriage controls the carriage movement.

For a complete description and detailed specifications on Axelson Tool Room, Medium-Duty and the new 25/16 and 32" Heavy-Duty Lathes: Write for bulletins A2-5507 and 5504.

AXELSON **Manufacturing Company**
Division of U. S. Industries, Inc.



NEW 32" HEAVY-DUTY LATHE. Designed for flexible, effective operations, this machine combines rugged construction and precise operation.



HEADSTOCK. Twenty-four spindle speeds divided into a true geometric progression from 6 to 750 r.p.m. are ideally suited for a wide variety of work, permitting high speed turning and large diameter work in new metals and alloys.

SPEED SELECTION. Two levers make speed selection simple and fast. Position of the levers tells operator the speed at which spindle is running or the speed change desired. Automatic electric brake stops spindle instantly.

TOLERANCES ARE TOLERANCES . . . or are they?

L. A. Edwards

ASST. SALES MGR., THE CINCINNATI GEAR CO.

Our customers' gear specifications call for many different and often critical tolerances . . . say .0002" or .0003" or whatever they may feel is required for their product. Unless asked, we don't question a customer's specifications, but in some cases we've wondered why particularly close tolerances were called for — and if they were worth the *added cost*. We had an occasion to talk to one customer recently about some gears they had us make to .0002" pin size limit. This firm also made some of its own gears. We asked this man if they had any trouble adhering to such strict tolerances and he said yes they did, but if their parts were "close enough" they used them anyway!

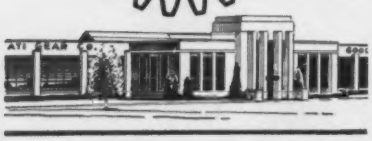
Now, this hardly seems logical — for if his own gears, made to slightly more liberal tolerances, were satisfactory for the job, he could have saved his company some money by being more realistic in his tolerance demands of us. We're not just trying to be philanthropic; it's a purely practical matter for us: unnecessarily critical requirements force us to enter a higher bid and so make our work more expensive than need be. Thus he paid more than necessary for the gears to do his job, and we ran the risk of losing a good customer. That's why we're always happy to see a customer go over his specifications with a sharp pencil.

THE CINCINNATI GEAR CO.

CINCINNATI 27, OHIO

"Gears — Good Gears Only"

CINTI



Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Brown & Sharp Mfg. Co., Providence, R. I.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Allen, Alva F., Box 426, Clinton, Mo.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferrocute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharp Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Ace Drill Corp., Adrian, Michigan.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co. Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd. Plymouth, Mich.

REAMERS, Taper Pin

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Michigan
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Michigan Drill Head Co., Detroit 34, Mich.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS

National Acme Co. (for counting), 170 E. 131st St., Cleveland, Ohio.

REELS, Stock, Standard and Automatic

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

(Continued on page 868)

Follow The Leaders...

Use Automatic Electric Trucks

Carrying approximately 6100 pounds per load, a fleet of Automatic Electric Trucks like the two above work around the clock, 365 days a year, in the hammer shop of a leading automobile manufacturer. Your own requirements may not be equally severe but all Automatic Electric Trucks are engineered to give comparable service when needed.

They work, too, for pennies an hour—cost less per year to own and less to operate...last years longer with only negligible down time.

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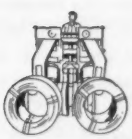
There's a model, too, that's exactly suited for your requirements. You'll find it fully described in Automatic's new 16-page catalog of America's most complete line of electric-driven trucks. *Write for your copy today.*

Address: Automatic, 133 West 87th Street, Dept.D-6, Chicago 20, Illinois



SKYLIFT GIANT
With fork or ram, capacities to 100,000 lbs.

DOCKER—for congested areas: 1,000 to 3,000 lbs.

LOW PROFILE SKYLIFT—Safer in low-clearance areas: 1,000 to 4,000 lbs.

TRANSVEYOR—for narrowest aisles. 2,000 to 4,000 lbs.

50th Automatic Anniversary

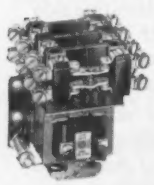
WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS

What **RELAYS** were most popular at the Chicago Machine Tool Show?

ALLEN-BRADLEY!
46.5% of all relays were A-B

Almost *half* of the relays that could be checked on 849 machine tools exhibited in Chicago's International Amphitheatre were made by Allen-Bradley. What an endorsement of the reliability obtained with this line of relays!

Allen-Bradley solenoid relays are the ideal choice for machine tool and similar sequence operations. These small but rugged relays have only *one* moving part. Their simple design assures consistency of performance . . . guarantees millions of trouble-free operations.



Bulletin 700, Type BX 4-pole Universal Relay. Can be easily changed from normally open to normally closed contacts by merely reconnecting the terminals.

Allen-Bradley Co.
1331 S. First St.
Milwaukee 4, Wis.

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Allen-Bradley Canada Ltd.
Galt, Ontario

A-B Quality

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL
The Preferred Line

RETAINING RINGS FOR BEARINGS, Etc.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

RIVET SETS
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic
Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

RIVETERS, Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Illinois
Wood & Co., R. D. Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

RUBBER PRODUCTS
Garlock Packing Co., Palmyra, N. Y.

RULES, Steel
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES
Houghton, E. F., & Co., 303 W. Lehigh Ave, Philadelphia, Pa.
International Chemical Co., 2628 N. Mascher St., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York N. Y.
Scherr, George Co., Inc., 200 Lafayette St. New York 12, N. Y.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment

SANDERS
Chicago Pneumatic Tool Co., 6 E. 44th St. New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Mattison Machine Works, Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St Rockford, Ill.
Thor Power Tool Co., Aurora, Illinois

SAW BLADES, Hack
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton Bldg., Cleveland, Ohio.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular
Consolidated Mch Tool Corp., Rochester, N. Y
Cosa Corp., 405 Lexington Ave., New York 17 N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa
DoAll Co., 254 Laurel Ave., Des Plaines, Ill
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton Bldg., Cleveland, Ohio.
H. P. Townsend Mfg. Co., Elmwood, Conn.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Wallace Tube Co., (Abrasive) 1304-08 Diversy Pkwy., Chicago 14, Ill.

SAWING MACHINES, Friction
DoAll Co., 254 Laurel Ave., Des Plaines, Ill
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWING MACHINES, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp. South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWS, Circular Metal Cutting
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

SAWS, Metal Cutting Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

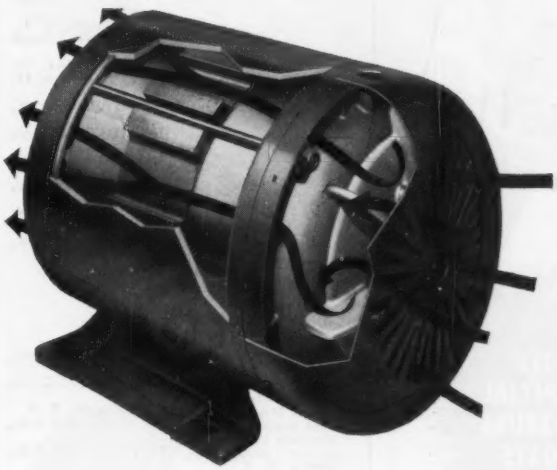
SAWS, Portable Electric
Millers Falls Co., Greenfield, Mass.
Thor Power Tool Co., Aurora, Illinois

(*Continued on page 370*)

HEAT-SOURCE VENTILATION

PLUS values in power

in HOWELL series one hundred motors gives you



GREATER MOTOR DEPENDABILITY

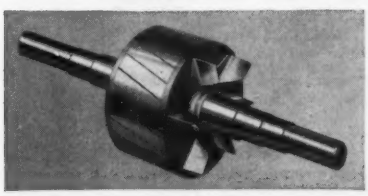
EXTRA INSURANCE AGAINST OVERHEATING

A faster, more efficient way to remove internal heat is a clear plus value for the man who buys motors. The cooler they run, the longer they last — and the more leeway there is to take intermittent overloading or excessively high air temperatures.

The laminations of Howell's new Series 100 Motors have unique, wide slots in their perimeters that carry the flow of fan-driven air right to the source of motor heat. There's 50% more contact between cooling air and the stator laminations than in conventional cores with smooth outer diameters.

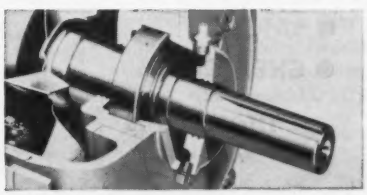
Compare any or all of the new rerated motors with the Howell Series 100. Only then will you have facts to make the best buy!

GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors



heat dissipating copper-clad rotors

Copper's faster heat conductivity (91% greater than aluminum's) reduces heat build-up in Series 100 motors. Copper rotors meet your special design requirements better, too.



Howellube greasing system checks over-lubricating

Grease enters and exits on same side of bearings — is never forced through to pack them tight. Results: longer bearing and motor life.

smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins, when a sleek, good looking motor costs no more.

For more details on Series 100 motors, write for Bulletin N-100-R

HOWELL Red Band MOTORS

HOWELL MOTORS

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

For more information fill in page number on Inquiry Card, on page 257

SAWS, Screw Slotting
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Illinois

SCREW DRIVING AND NUT SETTING EQUIPMENT
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Illinois

SCREW MACHINE TOOLS AND EQUIPMENT
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney Co. Inc., West Hartford, Conn.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P.O. Box 350.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Eastern Mch. Screw Corp., New Haven, Conn.
Mueller Brass Co., Port Huron 35, Mich.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, M. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand
See also Lathes, Turret
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.
Threadwell Tap & Die Co., Greenfield, Mass.

SCREWS, Cap, Set, Safety Set and Machine, Etc.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping, Drive
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

(*Continued on page* 372)

NEW

Contour Gripping FIXTURE

TAKE BIGGER CUTS
- FASTER
- SAFER
- CHEAPER

NO MORE BLOCKING SHIMMING — HOLDS ANY SHAPE IN ANY POSITION

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

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Act Now!

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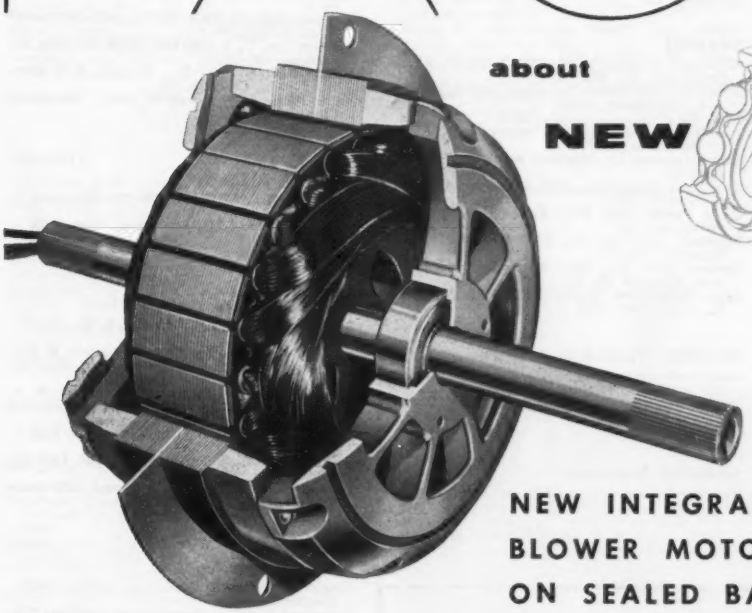
FACTS

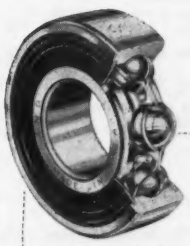
about

NEW DEPARTURE

BALL BEARINGS



NEW INTEGRAL-DRIVE BLOWER MOTOR DEPENDS ON SEALED BALL BEARINGS!



5 advantages of New Departure's Sentri-Seal ball bearings in electric motor applications

- **SEALED AND LUBRICATED FOR LIFE!** No need for relubrication; no danger of over- or under-lubrication.
- **SIMPLIFY DESIGN!** Eliminate need for separate seals and grease fittings.
- **CARRY LOADS IN ANY POSITION!** Moving parts are held in positive alignment, regardless of motor mounting position.
- **WEAR IS NEGLIGIBLE!** Require no attention for adjustment for wear. Have a reputation for outlasting the products they serve.
- **QUIET-RUNNING!** New Departure ball bearings are precision-made, run smoothly. Their uniformity is a guarantee of dependability.

Nowhere is the superiority of New Departure sealed ball bearings in electric motor applications better exemplified than in this new integral-drive blower motor.

Revolutionary "inside-out" design of this new motor imposed a lubrication problem solved by the permanent-lubrication characteristic of the finest sealed ball bearings. In this motor, the rotating element, to which the blower wheel is attached, is on the outside and revolves around a stationary shaft through which the lead wires pass. "Sealed and lubricated-for-life" New Departure ball bearings were selected because they assure permanent lubrication, regardless of centrifugal force. Also, because motor and blower wheel share the same permanently lubricated bearings, this integral unit is free of the need for periodic servicing.

Equally important, New Departure sealed ball bearings handle combination loads in any position . . . assure positive alignment of rotor and stator. This means a versatility of application for this motor that offers new freedom to designers.

Sealed ball bearings also help increase motor efficiency and reduce electrical hum. Since in ball bearings wear is so slight as to be entirely negligible, designers were able to build in a smaller precision air gap, which is maintained throughout motor life.

Let New Departure's unexcelled engineering service show you the many advantages of sealed ball bearings in electric motor and other applications.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

For more information fill in page number on Inquiry Card, on page 257

SEALS AND RETAINERS, Oil or Grease
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Illinois

SECOND-HAND MACHINERY, Etc.
Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co., Box 770, Saginaw, Mich.

SEPARATORS, Centrifugal
De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant
Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

SHAFTING, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SHAFTS
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored
Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground
Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SHAPER-PLANERS
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS
American Schiess Corp., 1232 Penn Ave., Pittsburgh 22, Pa.
American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Atlas Press Co., Kalamazoo, Mich.
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS, Structural
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

SHEARS, Rotary
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.

SHEARS, Squaring
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

SHEET METALS
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bridgeport Brass Co., Bridgeport, Conn.
New Jersey Zinc Co., 160 Front St., New York, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

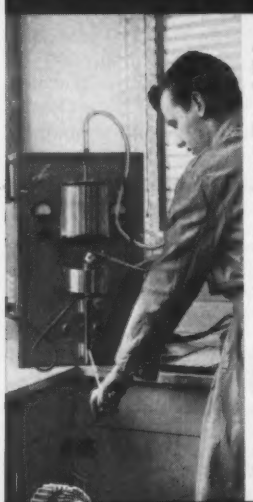
SHEETS, Iron and Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS
Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.

Another of the Reasons Behind Brad Foote Quality—

CARBON DETERMINATION



• In hardening gear teeth by carburizing, carbon content and depth of penetration are vitally important. BRAD FOOTE insures precise control of these factors through metallurgical tests with equipment developed specifically for this purpose.

• A test bar goes through the complete carburizing and heat-treating cycle with every batch of carburized gears. Shavings are taken from this bar at carefully measured depths. Chemical analysis of these shavings gives complete and precise data on carbon content and penetration.

• Carbon determination tests are only one of many metallurgical controls that insure the uniform quality of BRAD FOOTE Gears. Metallographic examination, hardness testing, chemical analysis—these are just a few of the quality checks provided by BRAD FOOTE's completely equipped metallurgical laboratories.

• Add these precise controls to specialized production and heat-treating equipment and a wealth of detailed experience in producing gears of all types—you begin to appreciate why BRAD FOOTE can produce better quality gears at substantial savings.

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Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Shenango-Penn Mold Co., Dover, Ohio

SLOTTING MACHINES

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

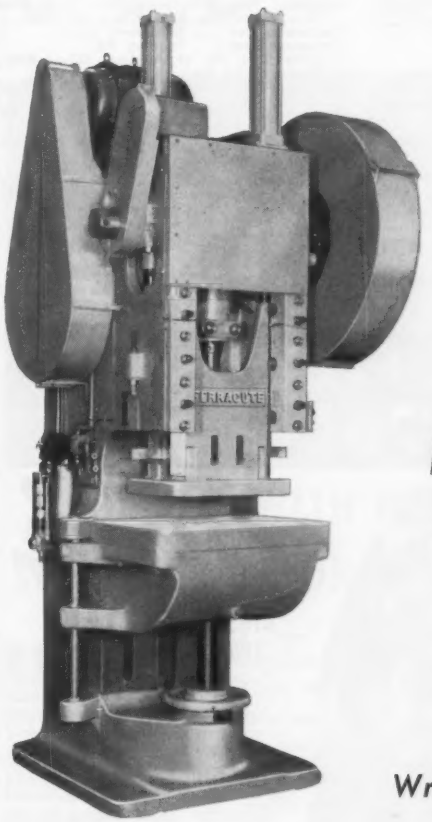
SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS

Acromark Co., 9-11 Morrell St., Elizabeth, N. J.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio.
Buhr Machine Tool Co., Ann Arbor, Michigan
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Cross Co., Detroit, Mich.
Erie Foundry Co., Erie, Pa.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves, Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Mercury Engrg. Corp., Milwaukee, Wis.
Michigan Drill Head Co., Detroit 34, Mich.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

(*Continued on page 374*)



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Box type ram. Bar type ram knockout.
Air ram counterbalance.
Air friction clutch with interconnected brake. Automatic lubrication.
Adjustable, hinged bed.
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Write for complete details

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Manufacturers of Power Presses and Special Machinery • BRIDGETON, N. J.

Townsend, H. P. Mfg. Co., Elmwood, Conn.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Universal Engrg. Co., Frankenmuth 2, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 So. Cicero Ave., Chicago 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Boring and Milling

Pope Mchry. Corp., Haverhill, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STAMPS, Steel and Marking Dies

Acromark Co., 9-11 Morrell St., Elizabeth, N. J.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Ryerson, Jas. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.), Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

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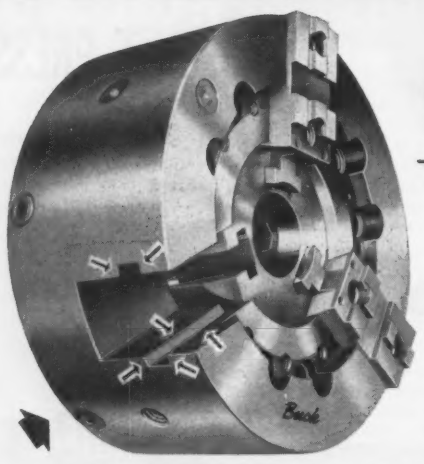

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Starrett, The L. S., Co., Athol, Mass.

STELLITE
Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS
Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES
Starrett, The L. S., Co., Athol, Mass.

STRAIGHTENERS, Flat Stock and Wire
Lewis Machine Co., 3441 E. 76th St., Cleveland 27, Ohio
Sesco, Inc., 8881 Central, Detroit 4, Mich.
U. S. Tool Co., Inc., 225 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Springfield Mch. Tool Co., Springfield, Ohio
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

STUD SETTERS
Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

SUPERFINISHING MACHINES
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES
See Plates, Surface

SWAGING MACHINES
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.

SWITCHES
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

TACHOMETERS
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer
Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard
Chicago Screw Co., Bellwood, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

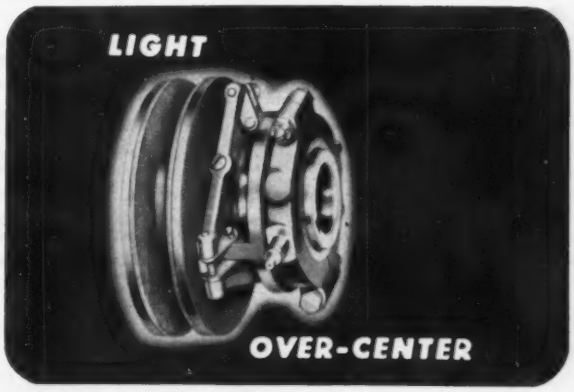
TAP HOLDERS
Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

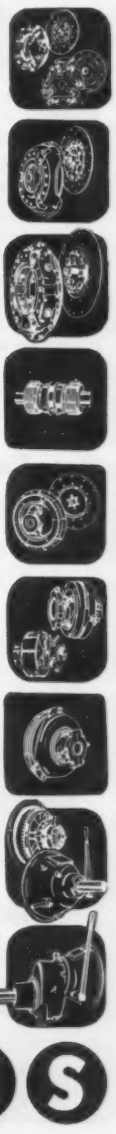
TAPPING ATTACHMENTS AND DEVICES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Machine Tool Co., Ann Arbor, Michigan
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 70, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.

(*Continued on page 376*)

ROCKFORD





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Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Townsend, H. P. Mfg. Co., Elmwood, Conn.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Michigan Drill Head Co., Detroit 34, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Coulter, James, Machine Co., Bridgeport 5, Conn.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney Co. Inc., West Hartford, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread

THREAD GRINDING MACHINES

See Grinding Machines, Thread

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn.
Lees-Bradner Co., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R.R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Sorp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1200 Woodward Heights Blvd., Ferndale, Mich.

TOOL CONTROLS

Royal Design & Manufacturing, Inc., 4133 E. Ten Mile Rd., Centerline, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and planing Tools

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Portage Double Quick Tool Co., 1063 Switzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol Mass.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Ryerson, Jos. T. & Son, Inc., 2558 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Ace Drill Corp., Adrian, Michigan.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Newcomer Products, Latrobe, Pa.
Spiral Step Tool Co., Chicago 25, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
du Mont Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Lathrobe, Pa.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Machine Tool Co., Ann Arbor, Michigan
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Michigan Drill Head Co., Detroit 34, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBE MILLS

Abbey-Etna Co., 2444 Maplewood Ave., Toledo 10, Ohio.
Yoder Co., 550 Walworth Ave., Cleveland Ohio.

TUBE TESTING AND EXPANDING MACHINE

Hydropress, Inc., 350 Fifth Ave., New York 1 N. Y.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York N. Y.
Bridgeport Brass Co., Bridgeport, Conn.
Mueller Brass Co., Port Huron 34, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co. 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
National Tube Div., U. S. Steel Corp., 525 Wm Penn Place, Pittsburgh, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St. Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio

TWIST DRILLS

See Drills, Twist

UNIT HEATERS

L. J. Wing Mfg. Co., Linden, N. J.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wasen Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

VALVE CONTROLS

Philadelphia Gear Works, (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

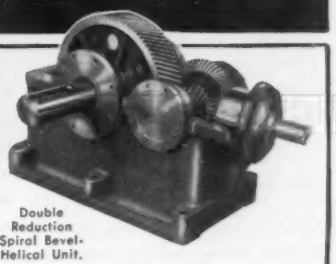
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines Ill.
Hunt, C. B., & Son., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1 N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(*Continued on page 378*)

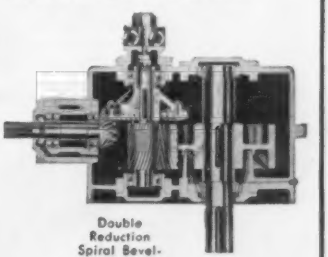
You . . . get more to Start With



Double Reduction Spiral Bevel-Helical Unit.

A glance at illustrations shown, will convince you of "plus features" of these quality built reducers ● Gears are Spiral-Bevel and Helical types to assure quiet operation at high speeds, and increased tooth strength ● Pinion shafts are integral with gears and finished to close tolerances by grinding ● Ball or Roller Bearings support shafts and are designed to take combined radial and thrust loads ● Housings are quality grey cast iron with all points of stress properly ribbed to reduce deflections and stresses to minimum; also housing design provides adequate oil reservoir and large radiating surface for thermal capacity ● Vertical Units are equipped with "dry well," which keeps oil from leaking at low speed shaft. Hundreds of Philadelphia Spiral-Bevel Helical Units are used throughout Industry, driving Paper Machines, Conveyors, Autoclaves, Blowers, Draw Benches, Fans, Chillers, Machine Tools, Laundry Machinery, Cement Machinery, Rubber Mill Machinery, Wire Drawing Machinery, etc.

Be convinced, send for Catalog # SB-50, which describes all types of Horizontal and Vertical Spiral-Bevel Helical Units.



Double Reduction Spiral Bevel-Helical Unit, Vertical Type.

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Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich.

VIBRATION INSULATION
American Felt Co., Glenville, Conn.

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Ampogrip Corp., Willimansett, Mass.
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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
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Universal Engineering Co., Frankenmuth 2, Mich.
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Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
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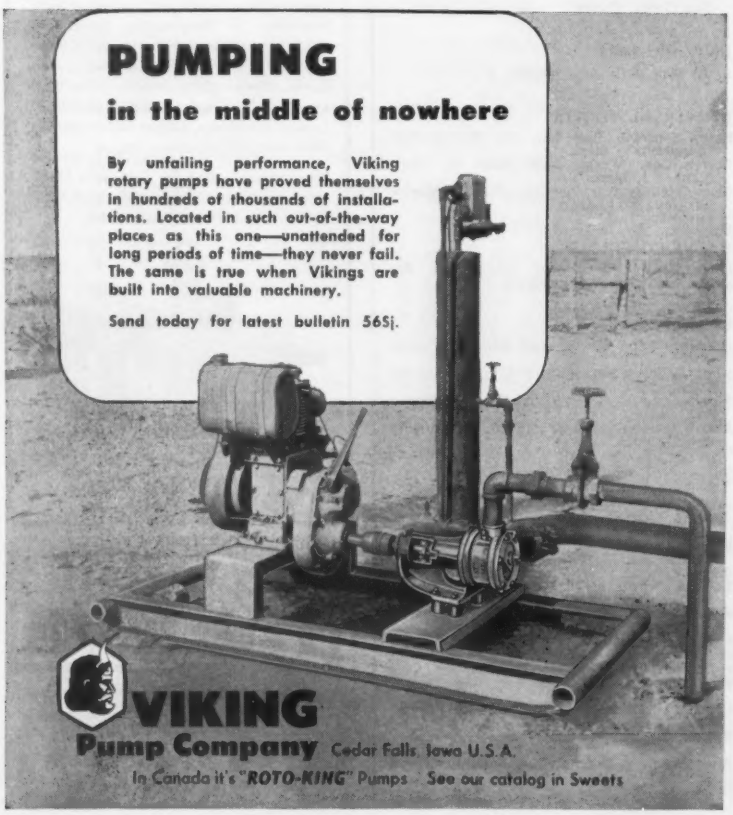
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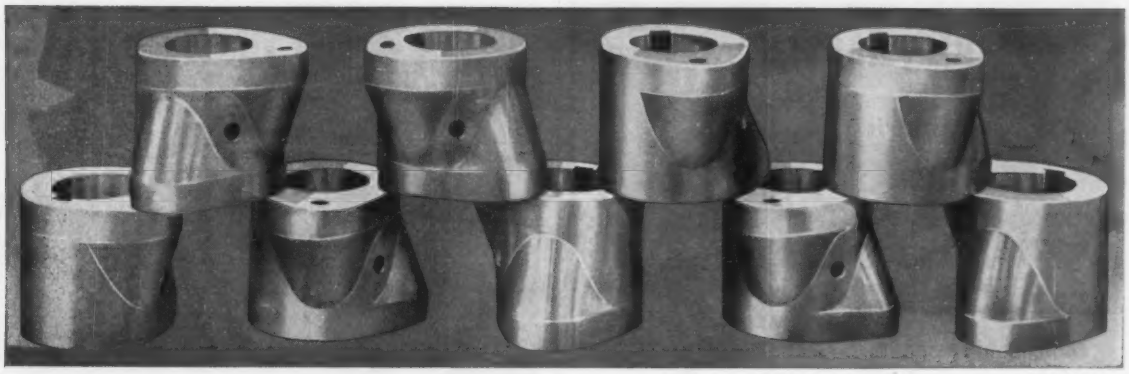

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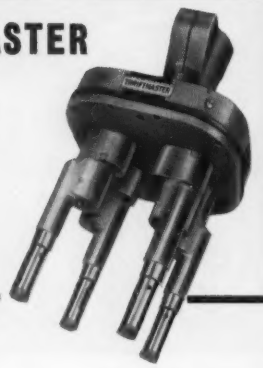

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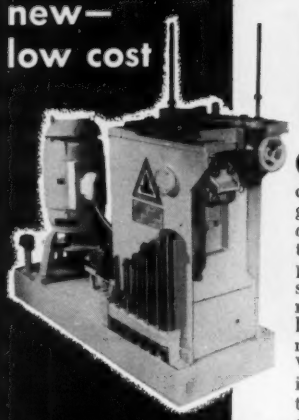

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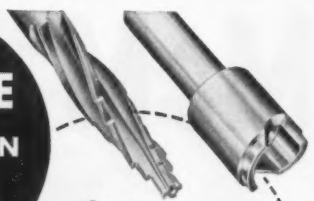

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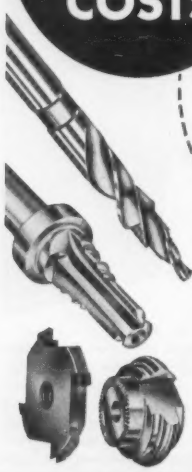

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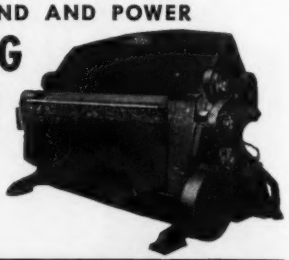

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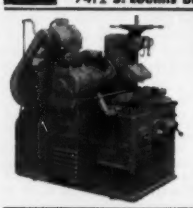

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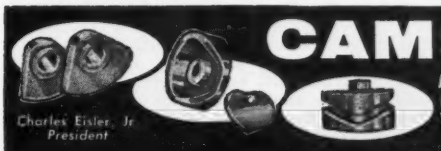

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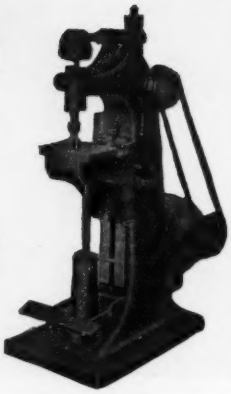

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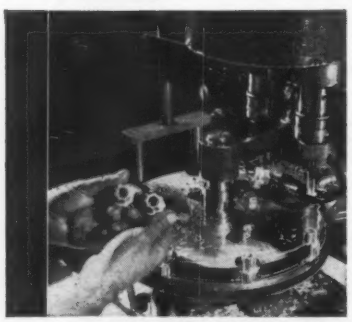

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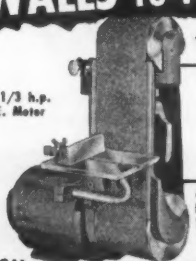

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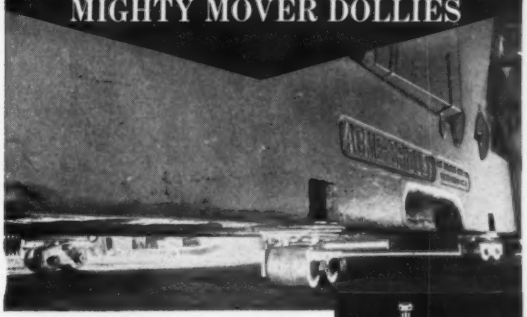

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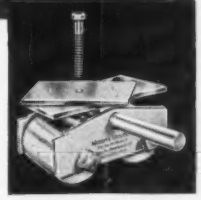

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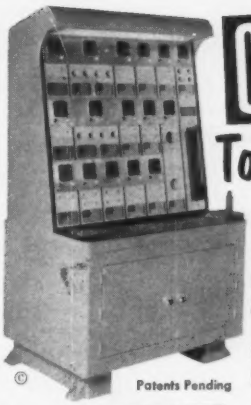

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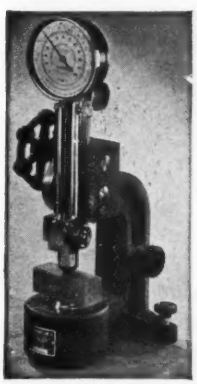

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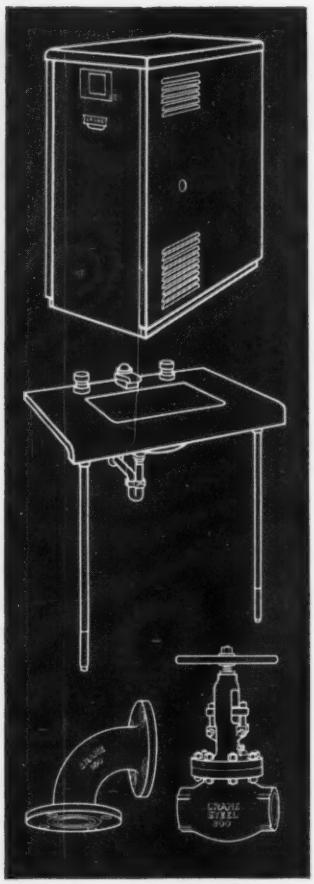

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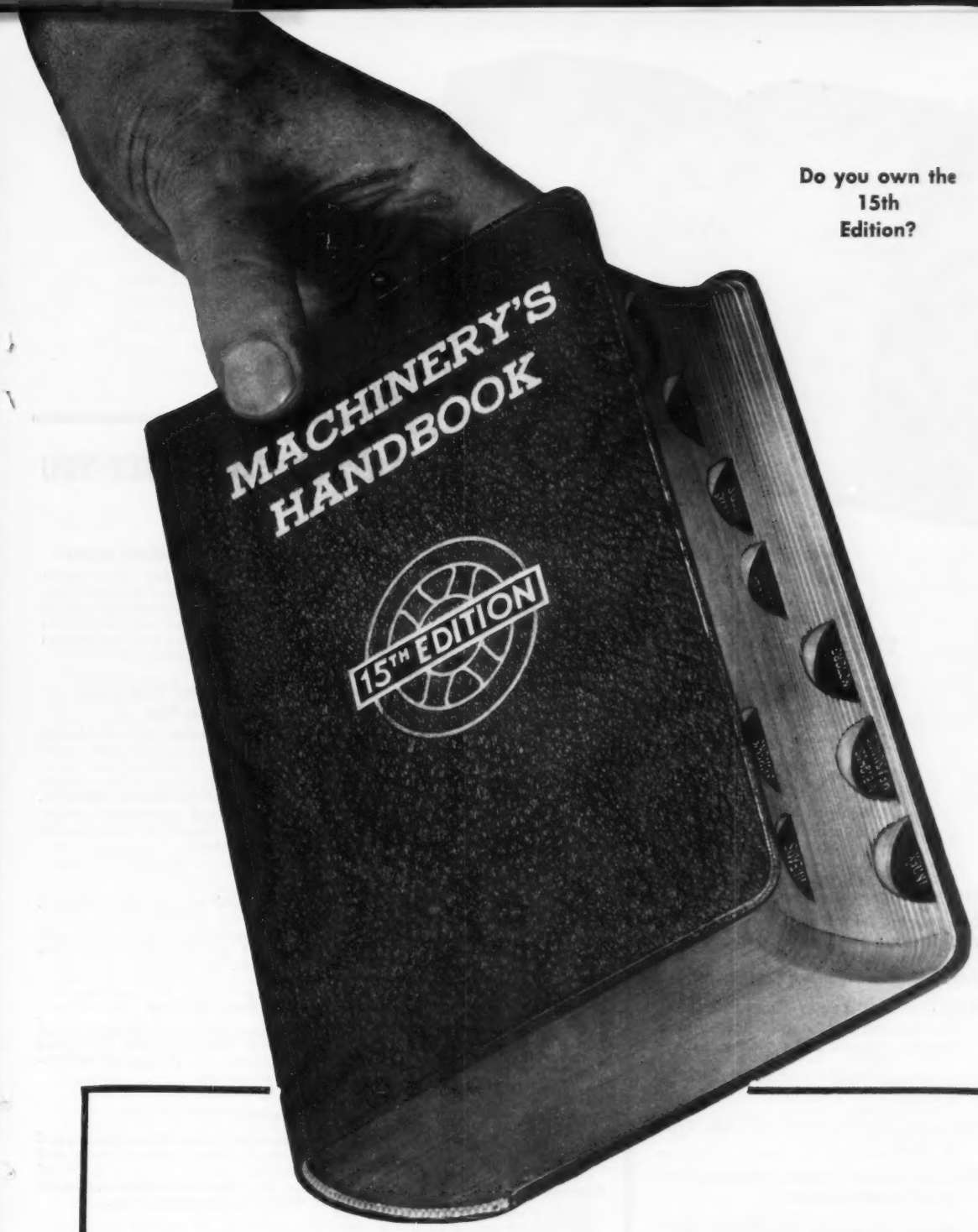

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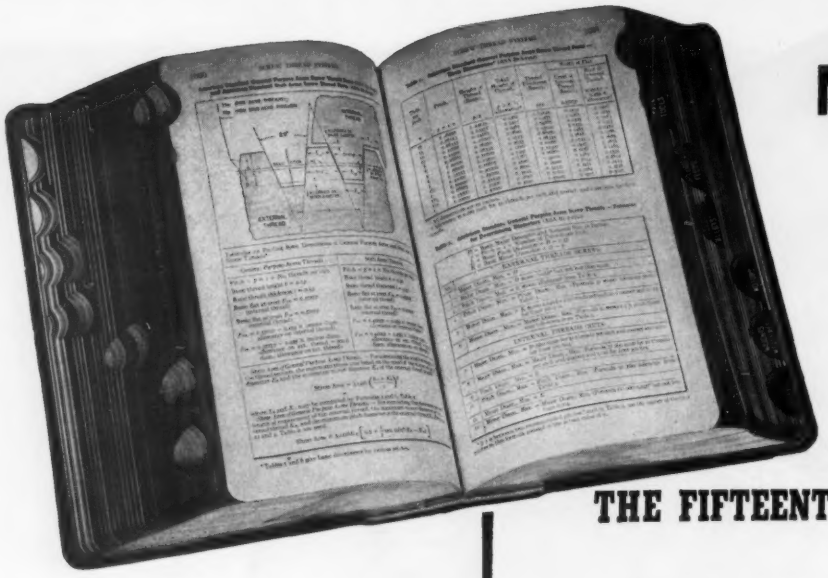

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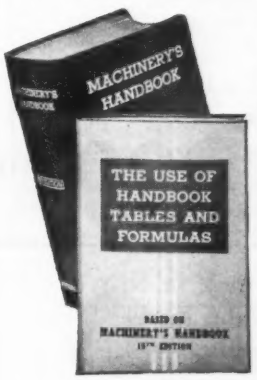

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Honing Process
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Chromium Plating
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Allowances and Tolerances
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No. 130 Cleveland Rigid Hobber

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18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

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#49 Excello Double End

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The above is only a partial listing
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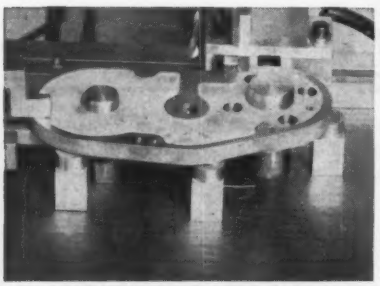
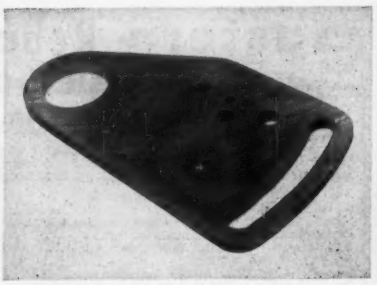
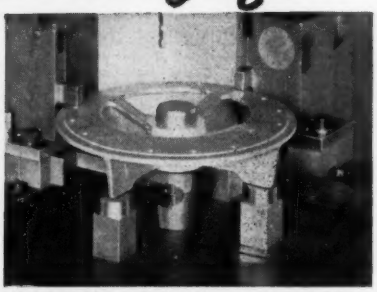


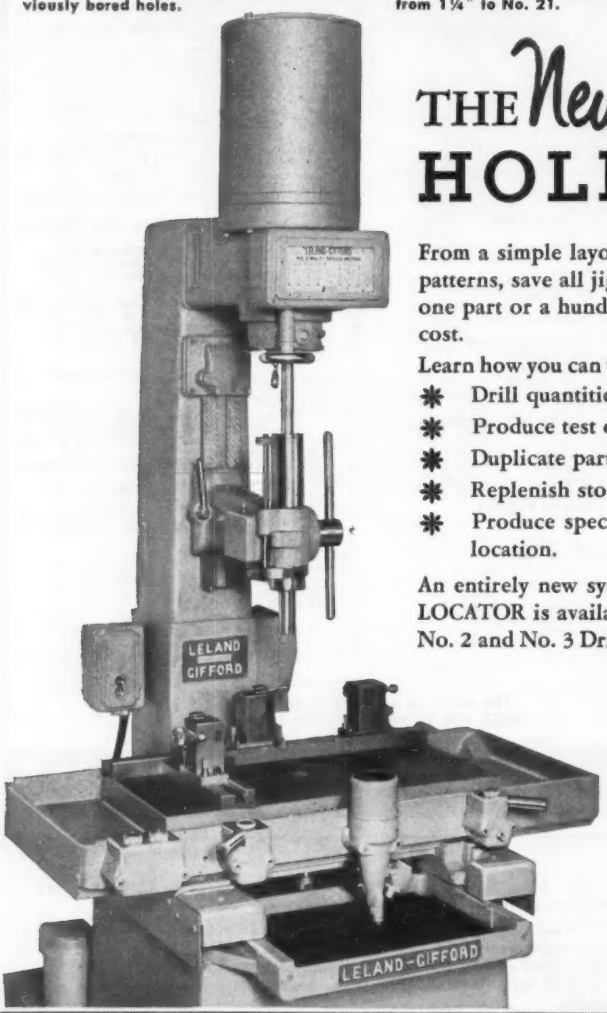
Thirteen holes (4 tapped, 1 reamed, 4 counterbored) are drilled in relation to two previously bored holes.



Nine holes plus five extra operations take only 24 minutes per part. Hole sizes range from 1¼" to No. 21.



Twelve holes are drilled and tapped in this aluminum motor fan in precise relation to the hub and webs.



THE *New* LELAND-GIFFORD HOLE LOCATOR

From a simple layout chart, you can locate and drill complex hole patterns, save all jig costs, eliminate piece by piece layout, produce one part or a hundred in a fraction of the time, at a fraction of the cost.

Learn how you can use the new Leland-Gifford HOLE LOCATOR to:

- Drill quantities of parts not requiring jig borer accuracy.
- Produce test or experimental pieces.
- Duplicate parts for repair or maintenance.
- Replenish stocks of replacement parts.
- Produce special parts requiring modification in hole size or location.

An entirely new system for locating and drilling holes, the HOLE LOCATOR is available in the capacities of standard Leland-Gifford No. 2 and No. 3 Drilling Machines. Write for complete information.

HOW IT WORKS

Hole locations are precisely established from intersecting lines scribed on a metal chart from blueprint dimensions. An optical viewer with double cross hairs and 20X magnification aligns the table with the layout chart which is registered in relation to the machine spindle. Dual locks release to permit lateral, forward and back, or compound motion of the table. The work is held on the table by quick-acting clamps. Duplicate parts can be produced from the same layout or the chart can be filed for future use.

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ALPHABETICAL INDEX OF ADVERTISERS

A

Abbey Etna Co. 265
Ajax Electric Co. 353
Allegheny Ludlum Steel Corp. 114
Allen-Bradley Co. 52-53, 368
Allen Manufacturing Co. Insert bet. 126-127
American Brass Co. 38
American Broach & Mch. Co. ..... Insert 91-106
American Chain & Cable 298
American Schiess Corp. 345
American Sip Corp. 80-81
American Tool Works Co. .. 37
Ampogrip Corp. 370
Armstrong-Blum Mfg. Co. .. 84
Armstrong Bros. Tool Co. .. 26
Austin Industrial Corp. 46
Automatic Transportation Co. 367
Automotive Gear Works, Inc. 75
Avey Drilling Mch. Co. 342-343
Axelson Manufacturing Co., Division U. S. Industries, Inc. 365

B

Baker Brothers, Inc. 355
Baldwin-Lima-Hamilton Corp., Hamilton Div. 299
Barber-Colman, Co. Insert 91-106
Barnes Drill Co. .... Insert 91-106
Barnes, W. F., John Co. 91-106
Besly-Welles Corp. 296
Bethlehem Steel Co. 116-119
Birdsboro Steel Foundry & Mch. Co. 142
Blanchard Machine Co. 60
Bliss, E. W., Co. 135-380
Bodine Corporation 152
Boston Gear Works 76
Brad-Foote Gear Works, Inc. 372
Bridgeport Brass Co. 263
Brown & Sharpe Mfg. Co. 241
Bryant Chucking Grinder Co. 130-131-251
Buck Tool Co. 374
Buffalo Forge Co. 48-49
Buhr Machine Tool Co. 64-65
Bullard Co. ..... Insert 69
Burg Tool Mfg. Co. 134

C

Carboloy Dept. of General Electric Co. 107-108-109-110
Carlton Mch. Tool Co. 357
Cincinnati Bickford Tool Co. 239
Cincinnati Gear Co. 366
Cincinnati Gilbert Mch. Tool Co. 77
Cincinnati Milling Machine Co. 6-7
Cincinnati Milling Products Process Machinery Div. .. 267
Cincinnati Milling Products Div., Cincinnati Milling Machine Co. 27-31
Cincinnati Shaper Co. 66-67
Cities Service Oil Co. 145
Classified Advts. 389
Clearing Machine Corp., Div. U. S. Industries Inc. 333
Cleveland Automatic Machine Co. 303
Cleveland Crane & Engrg. Co. 30
Cleveland Punch & Shear Wks. Co. 361
Cleveland Twist Drill Co. Insert 87
Cleveland Worm & Gear Co. Inside Back Cover
Climax Molybdenum Co. 113-323
Colonial Broach & Machine Co. 300
Columbus Die-Tool & Mch. Co. 339
Cone Automatic Mch. Co., Inc. 127
Consolidated Machine Tool Co. 39-40-41-42
Cosa Corp. 153
Crane Packing Co. 128
Cross Company 150-151
Crucible Steel Co. of America 115-117
Cumberland Steel Co. 122
Cuno Engineering Corp. 140

D

Danly Mch. Specialties, Inc. 85
Davis & Thompson Co. 352
Davis Keyseater Co. 382
DeLaval Separator Co. 301
Denison Engineering Co. 86
Diefendorf Gear Corp. 383
DoAll Company 293
Dreis & Krump Mfg. Co. 380
du Mont Corporation 376
Dykem Co. 379

E

Eastern Mch. Screw Corp. .. 360
Eastman Kodak Co. 123
Edlund Machinery Co. 327
Eisler Engineering Co., Inc. 381
Elox Corp. of Michigan 62
Erie Foundry Co. 335
Ex-Cell-O Corp. 249-269-277

F

Fafnir Bearing Co. .. Front Cover
Federal Bearings Co., Inc. .. 52
Federal Machine & Welder Co. 74
Federal Products Corp. .. 320-321
Fellows Gear Shaper Co. 4-5
Ferracute Machine Co. 373
Fiske Brothers Refining Co. 328
Foote-Burt Company 32
Fosdick Machine Tool Co. .. 133
Frauenthal Div., Kaydon Engrg. Corp. 136-137
Frew Machine Co. 383

G

Gallmeyer & Livingston Co. 336
Gardner Machine Co. 23
Garlock Packing Co. 359
General Electric Co. Insert 286-287
Giddings & Lewis Machine Tool Co. 24-25
Gisholt Machine Co. Insert bet. 32-33
Gits Bros. Mfg. Co. 279
Gleason Works 317
Gorton, George, Machine Co. 285
Goss & DeLeeuw Mch. Co. .. 302
Grant Mfg. & Machine Co. .. 382
Gray, G. A., Co. 63
Greaves Machine Tool Div. 334
Greenlee Bros. & Co. Insert 91-106

H

Hamilton Tool Co. .. 347-348-349
Hannifin Corporation 362-291
Hardinge Brothers, Inc. 156
Haynes Stellite Div., Union Carbide & Carbon Corp. .. 120
Heald Machine Co., The Inside Front Cover
Holcroft & Co. 322
Horton Chuck Co. 364
Howell Electric Motors Co. 369
Hunt, C. B. & Son, Inc. 310
Hydraulic Press Mfg. Co. 311

I

Industrial Filtration Co. 283
Industrial Press 385-386-387-388
Ingersoll-Rand Co. 43
International Chemical Co. .. 346

J

Jacobs Manufacturing Co. Insert bet. 126-127
Johnson Manufacturing Corp. 340
Jones & Lamson Machine Co. ..... 51, Insert 124-125

K

Kaufman Manufacturing Co. 382
Kearney & Trecker Corp. .. 20-21
Kennametal, Inc. 315

L

Lake Erie Engineering Corp. 324-325
Laminated Shim Co., Inc. 294
Landis Machine Co. 2-3
Landis Tool Co. 10-11
Lapmaster Div., Crane Packing Co. 128
LeBlond, R. K., Machine Tool Co. 78-79
Leland-Gifford Co. 390
Lincoln Electric Co. 318
Linde Air Products Co., Div. Union Carbide and Carbon Corp. 70
Lodge & Shipley Co., The 273
Lowe Brothers 282
Lubriplate Div., Fiske Bros. Refining Co. 328

M

Madison-Kipp Corp. 246
Marvel Engineering Co. 316
Materials Section 107-122
Mattison Machine Works Insert 91-106
McCrosky Tool Corp. 304
Metal Carbides Corp. 36
Micromatic Hone Corp. 146
Mighty Mover Co. 383
Millholland, W. K., Machinery Co., Inc. 306
Mitts & Merrill 379
Moore Special Tool Co. Insert 89
Morris Machine Tool Co. 261
Motch & Merryweather Mchry. Co. 88
Mueller Brass Co. 280-281
Mummert-Dixon Co. 380

N

National Acme Co. .. Insert 34-35
National Automatic Tool Co., ... 242-243
National Broach & Mch. Co. 129
National Tube Div., United States Steel Corp. 112
National Twist Drill & Tool Co. 17
New Britain Machine Co., The .... 44-45, Insert bet. 44-45
New Departure, Div. General Motors 371
New Jersey Gear & Mfg. Co. 379
New Jersey Zinc Co. 255
Niagara Machine & Tool Works 18-19
Nice Ball Bearing Co. 82
Nichols-Morris Corp. 61
Norton Company 14-15-54-55

O

Oakite Products, Inc. 111
Ohio Crankshaft Co. 143
Oilgear Co. 305
Oliver Instrument Co. 326
Orange Roller Bearing Co. Inc. 144
Orban, Kurt, Co., Inc. 345
Osborn Mfg. Co. 355
Ottemiller, Wm. H., Co. 381

P

Pangborn Corporation 392
Parker-Kalon Div., General American Transportation Corp. 337
Philadelphia Gear Works, Inc. 126-377

ALPHABETICAL INDEX OF ADVERTISERS

Pittsburgh Plate Glass Co. .. 339
Pope Machinery Corp. 132
Pratt & Whitney Co. 307

R

R and L Tools 47
Reed Rolled Thread Die Co. 314
Rehnberg-Jacobson Mfg. Co. Insert 91-106
Reliance Electric and Eng. Co. 141
Revere Copper & Brass, Inc. 253
Rivett Lathe & Grinder, Inc. 329
Rockford Clutch Div. of Borg-Warner 375
Rockford Machine Tool Co. Insert 91-106
Rollway Bearing Co., Inc. 363
Ross Operating Valve Co. 56-57
Rowbottom Machine Co. 379
Royal Design & Mfg. Co. 383
Russell, Burdsall & Ward Bolt & Nut Co. 256
Russell, Holbrook & Henderson, Inc. 149
Ruthman Machinery Co. 338
Ryerson, Joseph T. & Son, Inc. 158

S

Scherr, George, Co., Inc. 381
Schrader's A., Son, Div. Scovill Mfg. Co., Inc. 295
Scully-Jones & Co. 71
Seneca Falls Mch. Co. 83
Sheffield Corp. 297
Sheldon Machine Co., Inc. .. 332
Shenango-Penn, Mold Co. 292
Shore Instrument & Mfg. Co., Inc. 383
Sidney Machine Tool Co. 245
Simonds Saw & Steel Co. 319
Snyder Tool & Engrg. Co. 58-59
Socony Mobil Co., Inc. 53
South Bend Lathe Works 351
Spiral Step Tool Co. 380
Stahl Gear & Machine Co. 381
Standard Electrical Tool Co. 350
Standard Gage Co., Inc. 90
Standard Oil Co. (Indiana) 147
Standard Pressed Steel Co. 22
Sterling Grinding Wheel Co. 313
Stuart, D. A., Oil Co., Ltd. 341
Sun Oil Co. 271
Sundstrand Machine Tool Co. ..... Insert 91-106
Super Tool Co. 50
Supreme Products 290

T

Texas Company 154
Thompson Grinder Co. 72-73
Thor Power Tool Co. 331
Threadwell Tap & Die Co. .. 33
Thriftmaster Products Corp. 380
Timken Roller Bearing Co. Back Cover
Timken Roller Bearing Co. Steel & Tube Div. 121
Tomkins-Johnson Co. 288
Townsend, A. P., Mfg. Co. .. 308
Triplex Machine Tool Corp. 380

U

U. S. Burke Machine Tool Div. 148
U. S. Tool Company, Inc. 12-13
Union Carbide & Carbon Corp., Haynes Stellite Co. 120
Union Carbide & Carbon Corp., Linde Air Products Co., Div. 70
United States Drill Head Co. 118
United States Steel Corp. 112
Universal Engineering Co. .. 278
Used Machinery 389

V

Vanadium-Alloys Steel Co. .. 289
Van Norman Co. 8-9
Verson Allsteel Press Co. 138
Vickers, Inc. 309
Viking Pump Co. 378
Virginia Gear & Machine Co. 126-377

W

Wadell Equipment Co. 284
Waldes Kohinoor, Inc. 139
Wales-Strippet Corp. 381
Walker, O. S., Co., Inc. 344
Wallace Supplies Mfg. Co. .. 383
Walls Sales Corp. 382
Warner & Swasey Co. 28-29
Wesson Company Insert bet. 70-71
West Disinfecting Co. 354
Whitman & Barnes, Inc. 330
Wilson, K. R., Inc. 312
Wilson Mechanical Instrument Div., American Chain & Cable 298
Winter Brothers Co. 16

Y

Yoder Co. 68

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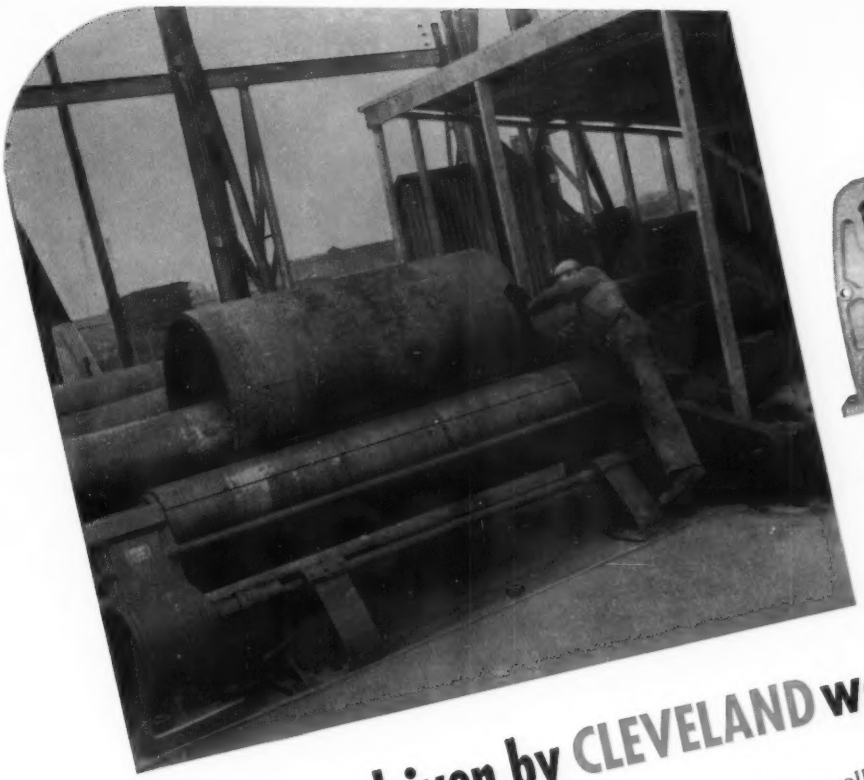
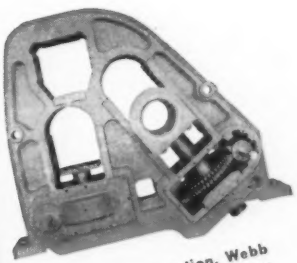




The Webb Corporation, Webb City, Mo., specializing in heavy duty bending rolls of the type shown at left, has long depended on Cleveland worm gear drives. Above is end frame of bending roll with worm gear set in place.

2½" plate bender driven by CLEVELAND worm gearing

HIDDEN from view, the heart of this bending roll is its Cleveland worm gear drive. Year after year, it transmits power smoothly from motor to the forming roll which curves heavy steel plate into perfect cylinders.

For many years Webb has listed Cleveland as standard equipment on its Model 16-L and other heavy duty machines. Webb's experience proves that worm gearing, as manufactured by Cleveland, withstands the extreme pressures of bending cold steel plates—as much as 2½" thick—and actually improves with use.

Whenever you need a drive that will keep its efficiency and stand up through years of severe service, specify a Cleveland Worm Gear Drive. Write for Catalog 400. The Cleveland Worm and Gear Company, 3276 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Drives

Forms metal by new cold flowing process— TIMKEN® bearings assure wall thickness within ±.002″

FLOTURN, a radically new metal-working process developed by Lodge & Shipley, applies continuous pressure to a metal blank, forming it to the shape of a mandrel. It's an extremely accurate process. Even under heavy loads at high speeds, this L & S No. 40 FLOTURN Lathe holds wall thickness tolerances to ±.002″.

One big reason for this accuracy is the Timken® tapered roller bearings on the spindle. The tapered construction of Timken bearings lets them take the heavy radial and thrust loads in any combination—holds the spindle in rigid alignment. And line contact between the rollers and races of Timken bearings gives them extra load-carrying capacity — important since the metal is shaped by very high pressures.

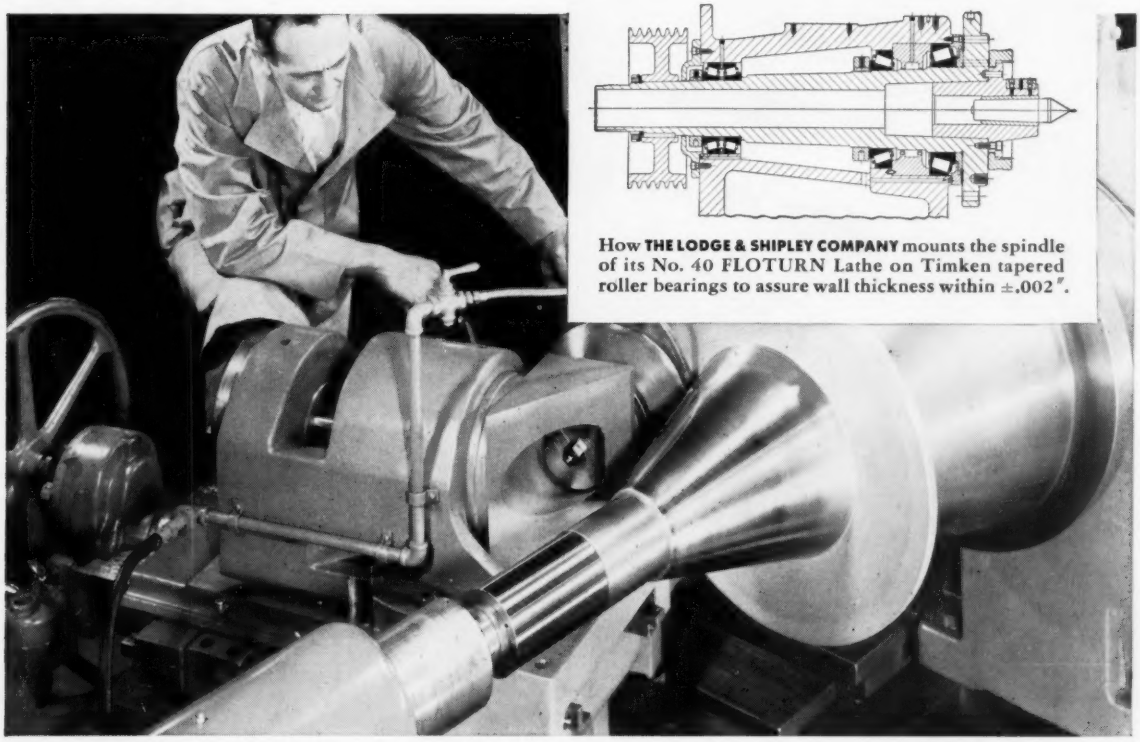
Timken bearings practically eliminate friction, saving power. The geometrically correct design of Timken bearings gives them true rolling motion; their accuracy lives up to that design.

Under normal usage, Timken bearings last the life of the machine tool. One reason is that they're made of Timken fine alloy steel. We have to make the steel ourselves, because that's the only way we can completely control quality. We're the only American manufacturer that does.

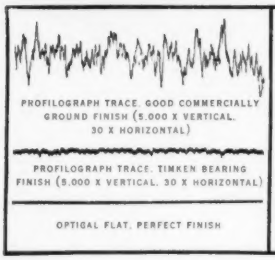
Whatever machine tool you build or buy, be sure it's equipped with Timken tapered roller bearings. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



How **THE LODGE & SHIPLEY COMPANY** mounts the spindle of its No. 40 FLOTURN Lathe on Timken tapered roller bearings to assure wall thickness within ±.002″.


PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
OPTICAL FLAT, PERFECT FINISH

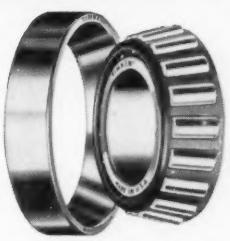
SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↓ AND THRUST →◎← LOADS OR ANY COMBINATION →✳←